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Small Universal Milling Machine.

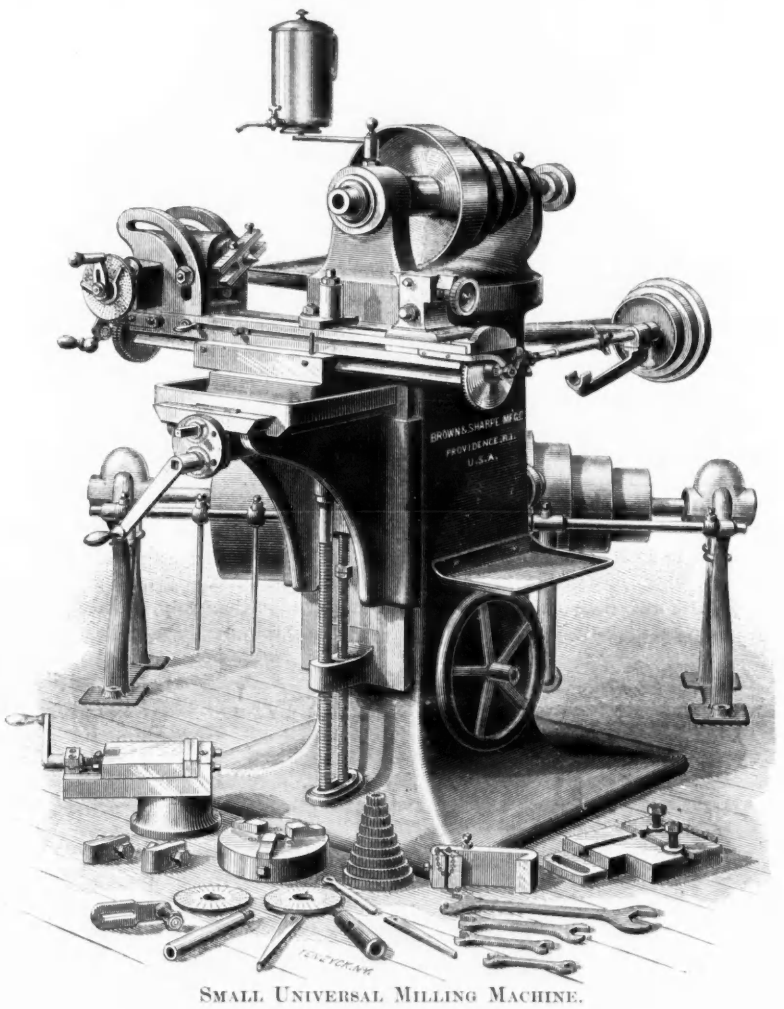
We present herewith an engraving of the small universal milling machine, together with some of the details, as built by the Brown & Sharpe Manufacturing Company, Providence, R. I. Referring to the principal engraving, the chief member of the frame is hollow and divided into apartments for holding the tools and appliances, such as wrenches, index plates, gears, &c., &c. The knee, which carries on its upper surface the spiral bed clamp, is raised or lowered through bevel gears, operated by means of the handle shown at the front side of the engraving. In reproducing a number of pieces it is sometimes essential to raise or lower this knee a definite distance, to provide for which a stop screw is arranged, provided with nuts capable of adjustment for any desired motion. When properly adjusted these nuts strike a permanent stop, after the knee has been raised or lowered the requisite distance, thereby arresting its further motion. These nuts being left in adjustment, provide for stopping at the same point in subsequent operations.

The spiral clamp bed permits the saddle carrying the spiral bed to be swiveled and clamped at any desired angle. It is moved forward and back by a screw which has its outer bearing in the same piece as the shaft which provides for the vertical adjustment of the knee, so that the crank can be moved from one to the other without necessitating a change of position of the operator. An index dial in front of the two journals is graduated to enable the workman to gauge the adjustment of both the knee and the clamp-bed in thousandths of an inch. A hand wheel is provided which can be used in place of the crank, it being better adapted for use in performing some of the more complicated operations of milling.

The power feed is arranged to feed not only at right angles to the axis of the spindle, but also at any other angle within 35 degrees either way; the positions or angle of the bed being determined by a suitably arranged index. The feed, which operates through a clutch and bevel gear at the end of the bed, is engaged and disengaged by moving a small conveniently located lever, while an adjustable stop provides for feeding a predetermined distance.

The vise (shown in engraving) has jaws 5 inches wide and $1\frac{3}{4}$ inches in depth, which will open $2\frac{3}{4}$ inches. These jaws may be taken off, being held in place by screws, and others designed for holding special and irregular work substituted.

One of the most important details of a machine of this class is the head-stock and spindle, which are shown in Fig. 1. It is essential that the spindle be subject to the least possible derangement from wear, for which purpose the front bearing is made of hardened steel carefully ground to a true, smooth surface. This prevents the wearing of the bearing, by which the original accuracy would be impaired, while the slight wear of the spindle is not of much importance, since the compensation is by longitudinal adjustment, by which the alignment is not disturbed.



SMALL UNIVERSAL MILLING MACHINE.

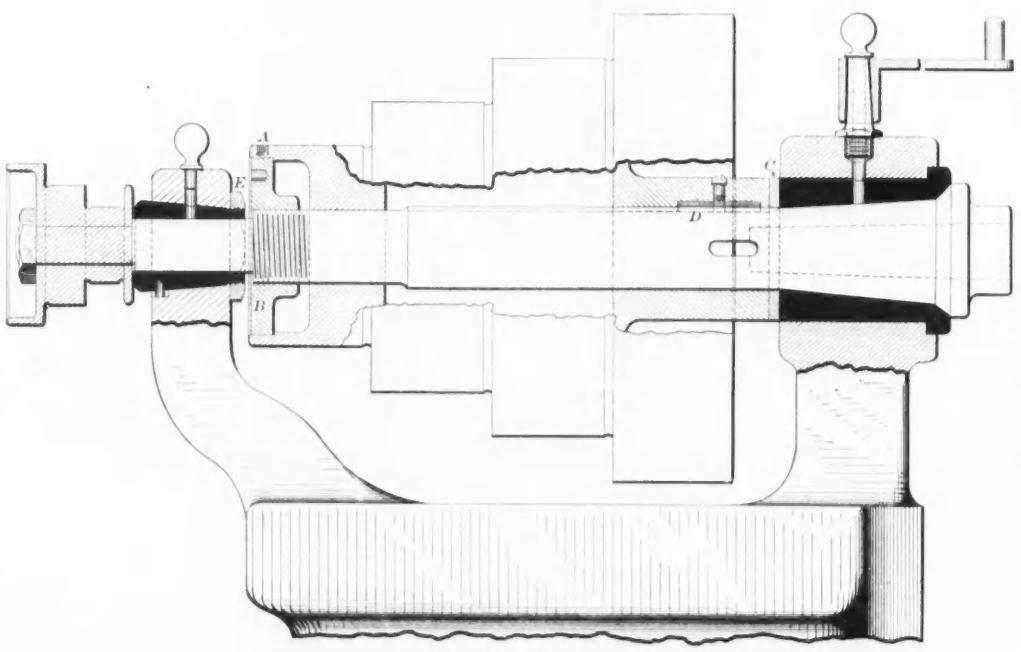


FIG. 1.

The principal or more important adjustment of the spindle is in the front bearing, and is accomplished by loosening the small screw *A*, which leaves the nut *B* free to be turned by a special wrench provided for the purpose. Turning this nut in the proper direction moves the cone forward, which presses the steel collar *C* against the box and draws the spindle back. When the front bearing is properly adjusted the nut is again locked by tightening the screw *A*. To adjust the back bearing the nut *E* is turned in the necessary direction.

It will be seen that this means of adjustment holds the spindle against longitudinal movement in the front bearing, leaving the rest of it free to move when affected by slight variations of temperature without danger of cutting shoulders or destroying the fine adjustment necessary for accurate work.

The spindle can at any time be taken out for examination, or other purposes, by removing the nut and feed cone from the end, placing the wrench on the nut *B* and revolving the cone until the nut is run off the thread, when the spindle may be withdrawn from the front end.

The cone has four changes for a 3-inch belt, and is carefully turned inside and outside to balance it. It is held in place on the spindle by the key *D* and the pinching screw, as shown.

The spiral head is shown in Fig. 2 (page 2). The spindle *C* is adapted to receive the same arbors that are used for carrying the cutters, and is given either a continuous or partial rotary movement by the operation of the worm and worm-wheel shown. To provide for adjustment for wear the worm-wheel is made in two parts, which are held together by screws. In practice this adjustment is seldom found necessary, since the parts are thoroughly protected from dust and chips. The steel bushes, shown black in the engraving, afford ample bearing for the worm shaft, and also serve as a pivot for the spindle box *B*, which allows the front end to be elevated or depressed to any extent desirable, the amount of the elevation or depression being indicated by graduations on one of the sides. When it is required to hold the head rigidly in any position it is done by tightening the bolt *F*, the spindle being always free to revolve. The index plate *I* is held in position by the pin *H*, and three of these plates being furnished with the machine the combination with the motion of the worm shaft thus provided admits of a large number of divisions. Besides thus providing for dividing work into uniform sections or parts, this head provides for a positive and regular rotative motion of the work, while at the same time a traversing motion is given to the bed, the velocity ratios of the two motions being regulated by means of change gears. This combination of movements is useful for cutting a large variety of spirals.

It is often desirable and sometimes necessary to run backwards, for which purpose the countershaft is made with two loose pulleys for open and cross belts. The pulleys are 14 inches in diameter and the combined width of face is 15 inches. The hangers are fitted with self-oiling boxes that are said to require attention but once a year; also with belt guides, stops, studs and shipping rod.

The bed can be fed either automatically or by hand $16\frac{1}{2}$ inches, and the cross feed, that is, the feed in line with the spindle, is 6 inches.

The spiral head and center will swing a piece 8 inches in diameter $13\frac{1}{2}$ inches long. The hole through the spiral head spindle is $1\frac{1}{16}$ inches in diameter, so that by means of the chuck long pieces of any size up to that diameter may be held while being operated upon.

The vertical movement of the knee is 15 inches, which provides for lowering the bed so that the top will be 16 inches below the center of the spindle; with a 2-inch cutter a piece 15 inches thick, 16½ inches long and 6 inches wide can be milled.

Arbors in five sizes are made for use with this machine, which take cutters with holes from ⅝ to 1¼ inches. Distance washers of different diameters provide for the use of cutters from 0 to 4 inches face.

All necessary wrenches with other accessories are furnished with the machine.

A Correction.

Editor American Machinist:

Let me send you a brief note of a correction needed in the sketch printed a few weeks ago of the common form of crab coupling for rolling mills. By some chance the fluted spindle is shown too short in the body to reach through the loose crab when this is slipped close into gear with the fast crab. It is always made just long enough in the body to give a full bearing on the fluting dogs in the loose crab, and the small end of the spindle reaches far enough to leave the small clearance against the end of the engine shaft, which is needed to let the parts slip readily into place.

Elgin, Illinois. P. BARNES.

A Large Shearing Machine.

We present with this an engraving of the large shearing machine recently designed and built for the Siemens-Anderson Steel Company by Cavett & McKnight, of Pittsburgh, Pa. The housings or upright frames of this machine are in four pieces held together by shrink links made from 2″ square iron, fourteen of these links being used.

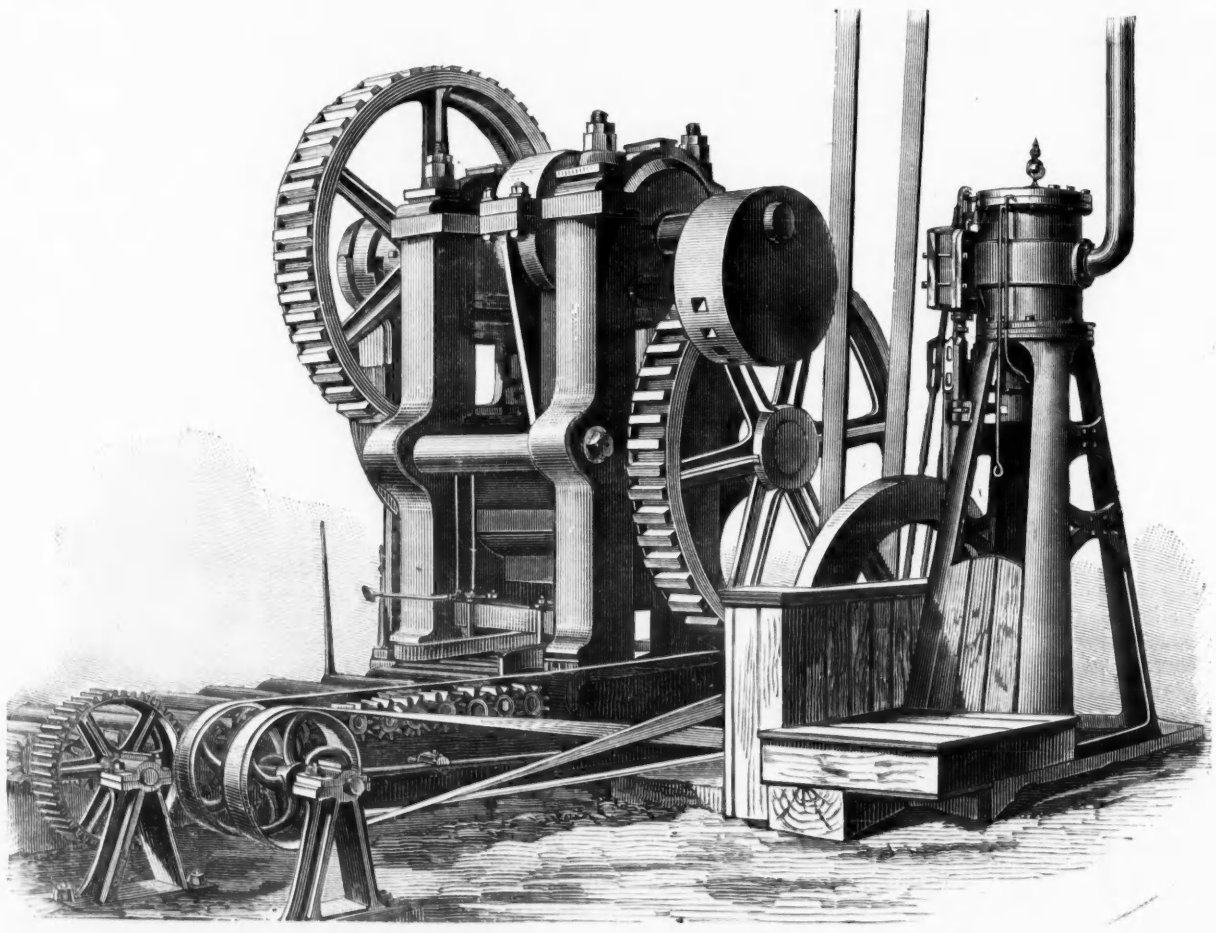
The main shaft is of steel 12″ in diameter running in babbitted boxes, giving a journal bearing 12″ in diameter and 19 inches long. The caps which receive the thrust due to the shearing are fitted with gun-metal boxes recessed in the cast-iron caps, which are held down by 4½″ steel bolts extending down through the columns. The eccentric for the cutting motion is of steel with a 12-inch face. From this the yoke extends to the head, to which the lower end is fitted to take the thrust direct, a 4″ steel pin lifting the head. The clutch gear is 8 feet in diameter, with a 12″ face and 5″ pitch, and weighs 4 tons. The clutch is operated by means of a pressure cylinder situated below.

An 18″×18″ upright engine furnishes the power, the engine shaft carrying a 24″ pinion which gears with an 8-foot spur on the 9″ steel countershaft, the other end of which carries a 24″ pinion gearing with the clutch gear.

A Mason clutch driven from the engine shaft is used for handling the table rollers.

The cutting blades are 38″ long, 8″ deep and 3″ thick, made in two lengths for convenience of handling.

This machine will cut blooms 7″×11,″ but was designed to cut blooms 8″×8″, and plates 4″×36″. The height of the machine is 16 feet, and the weight 72 tons.



A LARGE SHEARING MACHINE.

A New Propeller.

On Wednesday morning last Mr. C. F. Osborne exhibited to a few visitors at the Lambeth Baths, Westminster, a model of a steamer fitted with a new kind of propeller, which the inventor appropriately terms the fin-propeller. The model is an iron built vessel 6 feet long, and is fitted about midships and below the water line with a rectangular plate, placed parallel to a longitudinal vertical plane at each end, and in its center line this plate is coupled by a crosshead to a rod passing through the sides of the vessel, and being connected inside to the piston rod of one of the two steam cylinders, placed crosswise in the vessel and having their piston rods extending through both cylinder covers. The cranks of these cylinders being set at right angles to each other, the blades will receive a reciprocating motion, each end moving alternately to and from the sides of the vessel, which latter is by this means propelled. Mr. Osborne does not confine himself to this mode of attaching or working the fin-propeller, he proposes to use one at the stern of vessels, working it up and down instead of sideways, and to attach smaller fins to the side of the vessel to increase the propelling power and give ready means for steering and turning the vessel, which can be very easily done with these propellers by increasing or decreasing the speed of one of the pistons. For vessels of longer dimensions, Mr. Osborne proposes to arrange his fin-propellers in such a manner that they may be drawn up close to the sides of the vessel when not in use, and thus be quite out of danger. Shots fired at the blades would, should they be able to have any effect below water level at all, only perforate the blades without materially affecting their working, unless they were struck at the joints. The little model, which is only 6 feet long, and heated by spirit lamps, was worked with 30 pounds pressure, and run at a speed of about 200 feet per minute; the motion in the water was but very slight, and the vessel itself moved exceedingly steady. We shall be glad to see this principle, which Mr. Osborne has brought from South Africa, where his model has been making several trips of over an hour's duration on Simon's Bay, applied to some larger vessel so as to thoroughly test its capabilities.—*Engineering.*

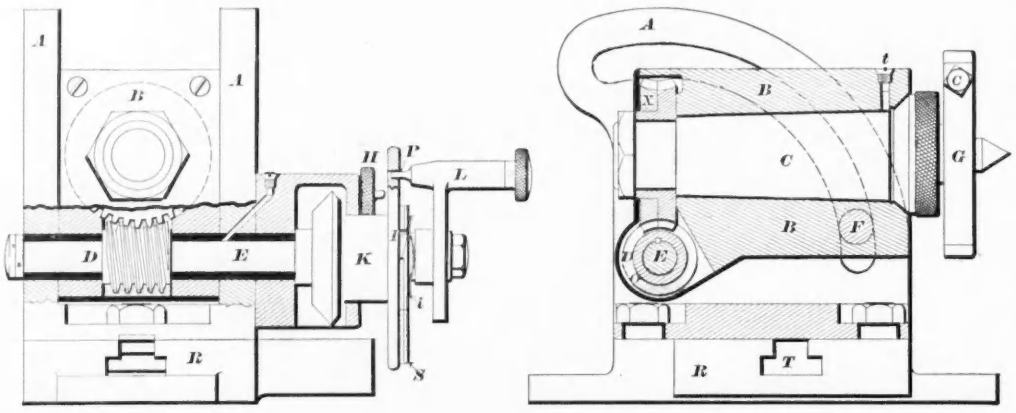


FIG. 2.—(See Page 1.)

A Jig Boring Bar for Taper Holes.

We noticed recently at the works of the Straight Line Company, a boring bar being made which, when completed would, with the exception of the dimensions, present something the appearance of the cut on next page. The bar was designed for boring a taper hole, the body *A*, for nearly its entire length, being fitted to the bearing of the jig, for guiding it.

To produce the taper the sliding rod, *b*, was fitted to a hole drilled near one edge of the body of the bar, or so as to leave say ⅛″ metal outside the hole. The lower end of this rod was offset and pointed like a center to fit in a countersink in the jig plate, or in an interposed piece of iron or steel. This center should be in line with the axis of the bar, and could be turned by fitting the rod tightly in the hole, and after turning, fitting it to slide freely. The surface of the rod nearest the axis of the bar is planed tapering (shown somewhat exaggerated in the cut) and the cutter, *a*, fitted to the slot so as to slide, from a slight pressure, a short distance without shaking. The inner end of this cutter is fitted to rest fairly against the planed surface of the rod.

The operation is as follows: The rod is at the beginning of the cut allowed to drop down a considerable distance out of the hole, the center resting in the countersink below. As the bar is fed down it slides over the rod, and the cut keeping the cutter against the inclined surface, the diameter bored will be less as the cut progresses, thus producing a regular taper in degree corresponding to the taper planed on the rod.

This bar is probably not intended for heavy work, the cutter operating perhaps more as a reamer for tapering a hole already bored straight. Of course it is not intended that the point of the sliding bar shall steady the boring bar, this being done by the jig bearing. The slot for the cutter might be further from the end of the bar, which could be guided by a second bearing below the piece being bored; or when used simply to taper a hole already bored straight, the end of the bar might be guided in the hole itself. In fact the particular bar referred to may be intended for use in this way. In this case, and generally, there should be a groove in the bar from the cutter to the end, to allow the chips to fall away.

A limited provision for compensation for wear could be provided by beginning with a piece of considerable thickness under the point of the sliding rod, which piece could be reduced, a thinner one substituted, or a liner removed as the cutter wore away.

Probably, in this instance, circumstances made it necessary to taper the surface of the sliding rod in the direction shown; otherwise it would seem to be better to plane the taper the other way, so that the rod would force the cutter to the work as the boring went on. This would bore a taper in the other direction.

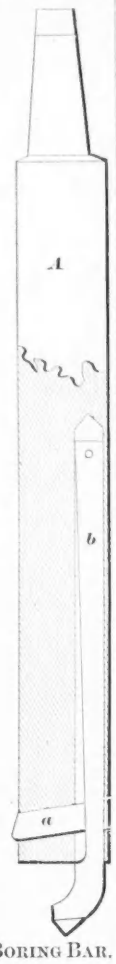
The small hole near the upper end of the sliding rod extends entirely through it, and is for the insertion of a small spring, somewhat longer than the diameter of the rod, which, by bearing against the sides of the hole, creates sufficient friction to prevent the sliding rod from dropping out of its own weight.

A boring bar, similarly constructed, might be used for a variety of purposes in light work, as, for instance, by making the end of the cutter that bears against the bar substantially a point; a hole of almost any outline could be bored, by making the pattern on the rod, and, if necessary, restraining the rod from a tendency to turn around in the hole. For an odd job of this kind the bar could be used in a lathe, by clamping a piece in the tool post, or in the back rest, through which a hole was bored to guide the bar.

A Mandrel Kink.

An engineer and manufacturer who has his mandrels made with three small grooves in the centers (by driving a three-cornered punch in the reamed centers) gives an additional reason besides providing for oiling for having them so. He says that in hardening the ends they, and of course the centers, are liable to get out of round, and that a piece turned on such a center will also be out of round. The three-cornered punch divides the bearing surface into three parts, and by so doing does away with the possibility of the arbor wabbling on the center.

One cost of railway construction not usually found in the bill of items is brought to mind by the uncontradicted statement that nineteen men have been killed and several more maimed within a month on one division of thirty miles of the Lake Shore Railroad. It is suggested that a little justice administered to the contractors would materially diminish the death rate.



BORING BAR.

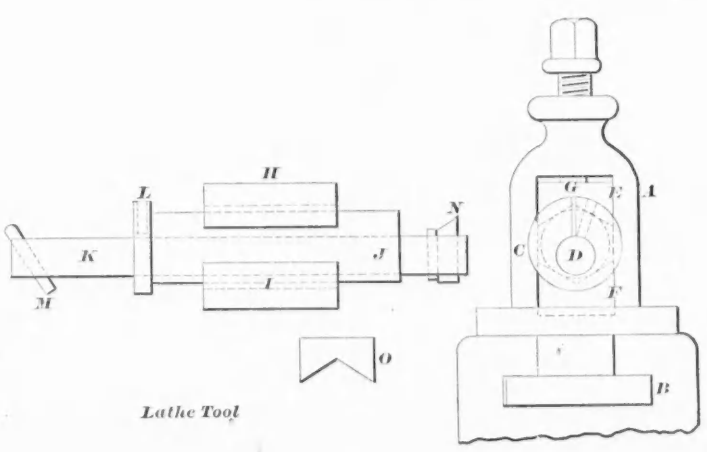
Shop Kinks.

No. 35.

BY LEWIS F. LYNE.

HANDY LATHE AND PLANER TOOLS.

Lathe hands often experience great difficulty in keeping boring-tools of the right shape and size to perform certain kinds of work. For example, a hole has to be bored in a casting for a babbitted box for a journal, which we will suppose to be ¾″ in diameter and 4″ long. In the first place it is generally difficult to find a tool to answer the purpose, as most of the tools in the shop will be found too long, too short or too large in diameter. When a suitable tool has been found and the hole bored of the right diameter, it has to be recessed to receive the babbitt metal. This requires a tool with a long cutting edge to cut out the recess without allowing the tool to drag, and often compels the workman to dress a new tool.



Lathe Tool

The lathe tool represented in the accompanying sketch represents one of the most economical lathe-boring tools I ever saw, and one tool made in this way will answer the purpose of a large number of boring tools made in the usual way from a solid bar of steel.

B is the top of the slide with the tool-post *A* attached to it in the usual way. Two V blocks, *E*, *F*, of steel, are placed in the tool-post with the steel thimble *C* between them. One of these blocks is shown at *O*.

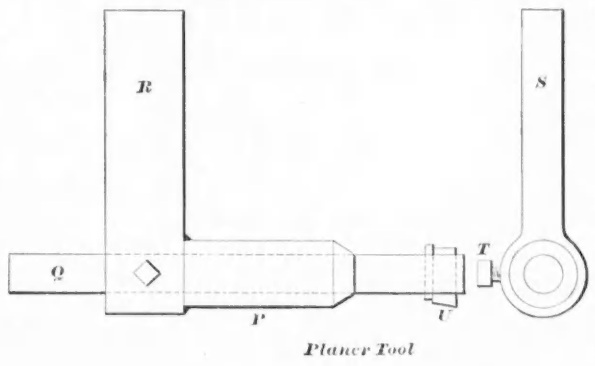
This thimble has a hole at one side through which the cutter-bar *D* is fitted to slide freely. This cutter-bar, which will be better understood from the view at *K*, is made of steel, and passes through the thimble *J*. One end has a tool-slot of a rectangular shape to receive the cutter *N*, which is held by a key. The other end has a square tapered hole into which the cutter *M* is driven with a light hammer. It will be found in practice that sometimes the style of cutter shown at *M* can be used to much better advantage than the one shown at *N*, and *vice versa*.

It will be observed that the thimble *C* is split through the thick side at *G*, the thin side allowing enough spring to insure a firm grip upon the cutter bar when the screw is tightened. The dies *H*, *I*, always hold the cutter bar in an axact horizontal position, if the ring that suports the block *F* is of a uniform thickness; therefore if it be required to raise or lower the tool a pin is inserted into the hole *L*, then by rolling the thimble *J* the tool may be adjusted as desired.

Sometimes it is very essential to elevate or depress the cutting edge of the tool without moving the body. This can be easily done by simply rolling the cutter bar. In turning brass a low sharp cutting edge is required, whereas for iron a high edge with a tip is necessary. All these small essential features can easily be secured with a tool made as here shown.

Instead of having the shears of a lathe covered with a lot of heavy and expensive cast steel tools, one of these tools with a little box of cutters made of the very best tool steel will be found of much greater value and a great deal less expensive. If, in dressing, a tool happens to be burned the effects will be observed for months afterward, but if a cutter is burned in dressing it can be thrown away at once without any considerable loss of time or money.

The planer tool also shown in the other engraving is simple in construction and of great value on planer work. It consists of a cast iron holder *R*, *S*, made of good strong iron. This holder is bored out and a cutter bar *Q* fitted as shown. This cutter bar is made of steel, and may be adjusted to any desired length and held by the set screw *T*. The cutter *V* is held by a key or set screw as may be the most convenient. When the hole is bored for the cutter bar the round part of the body *P* had better be turned, as it will be found convenient in setting some kinds of work.



Planer Tool

This tool is of great service upon planers in cutting key seats and slots in the hubs of wheels. It has the advantage of being adjusted to use the cutter in all positions. By permission of Ambrose Webster, superintendent of the American Watch Tool Company, Waltham, Mass., I present these tools to the craft for their consideration and use.

Don't be Contented.

After all, the old adage that recommends contentment under all circumstances is a good many parts wrong. Just as selfishness has made the world fit to live in, so discontentment with present positions and circumstances has incited people to fit themselves to live in the world. Money, however much we may be disposed to deny it, brings out the best efforts of the individual. If a mechanic is contented with what his present wages will buy, he has no particular incentive to become more proficient; but, fortunately he is not contented. He has no moral right to be contented. It is the fact that he is not contented that continually urges him to push ahead, partly perhaps for more glory, but particularly for more money. It is to the restless, discontented that we are mainly indebted for progress. It is these who are searching after things to satisfy themselves with. They make new inventions because they are not contented to use old ones, for the simple reason that their fathers used them.

Those who are contented with what they have, seldom have but little. The discontented apprentice wants to become a journeyman and labors to that end. He wants to be a better workman and still goes ahead. This don't make him contented, and he becomes foreman, superintendent, proprietor, simply because he isn't contented with present conditions. He isn't after honor so much as he is after something that more money will buy. In his progress he not only learns something himself, but a good many others learn something from him. The world is better because he was not contented to work for a dollar and half a day. The world may—probably will—make more out of his efforts than he himself, which is a good thing for the world.

The old adage has done duty long enough in its present form. It may do for old fogies, but then a thoroughly discontented man never grows old. If it is essential to preserve any of the traditions of the ancient maxim it ought to be made to read: Be content to be discontented.

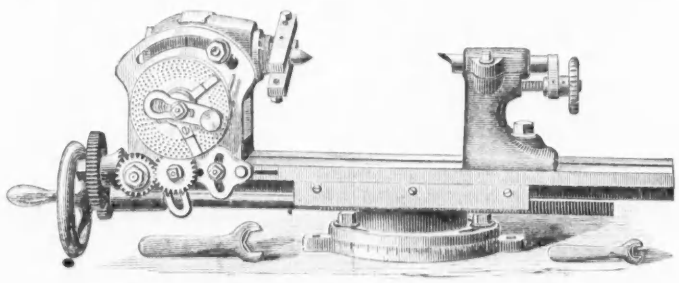
New Spiral Attachment to Milling Machines.

The advance of the milling machine as a simplifier of mechanical operations, which has been so rapid in the last few years, is necessarily attended by the appearance of new and improved attachments to be used with those machines, for a great variety of purposes.

Among the most common and useful of those appliances is the attachment for cutting spirals, which is now indispensable to a complete universal milling machine.

The accompanying engraving represents a spiral cutting device, which, with the regular gears furnished, will cut spirals, with pitch varying from one turn in 1.66 inches to one turn in 60 inches. A diameter of 10 inches will swing upon the centers, and, with a 25-inch slide, a length of 12 inches can be milled.

It will be readily seen, by the cut, that the above is a simple, straightforward construction, with the gearing readily accessible to changes.


SPIRAL ATTACHMENT TO MILLING MACHINES.

The attachment is manufactured by E. E. Garvin & Co., 139–143 Centre street, New York, to be used in connection with their No. 2 power milling machine. The graduated bottom plate, however, upon which the attachment swivels can be bolted or screwed to the table of any regular milling machine, and the device used therewith.

The weight of the attachment complete is about 130 pounds.

The Roumanian government offers $30,000 for the best design for a bridge over and a tunnel under the Danube, the offer being open to the engineers of the world. The bridge is estimated to cost some $4,000,000.

An inmate (against his will) of one of our State prisons says he was sent there for dishonest practice, and that his occupation is the putting of paper, to simulate leather, in the soles of shoes. This is one of the many ways in which the prison labor contract system assists in making reformatory institutions of our penal establishments. That man ought to be so thoroughly reformed by the time his term of service is up as to be able to cheat, like the contractor who employs his labor, for instance; that is, extensively and within the pale of the law.

Uniform Screw-Threads.

At the convention of the Master Car-Builders' Association, held in 1878, a committee was appointed to make an investigation and report on "The present construction of screws and nuts used on cars, and the degree of accuracy that it is desirable to secure, and the best means of maintaining it in the standard adopted by this association seven years ago." That committee made its final report at the last meeting of the association and was instructed "to send a copy of it, with a suitable circular, calling attention to the importance of adopting *the* correct standard Sellers' system of screw-threads, to the presidents, managers, superintendents and master car-builders of the United States, Canada and Mexico."

The committee do not think that it is necessary to say anything about the importance of uniformity in the screws of bolts and nuts, which all admit. Such uniformity, however, can only be secured by the general adoption of a *correct* standard. The Master Car Builders' Association has, therefore, instructed its committee to urge all railroad companies to adopt the Sellers' or Franklin Institute system for all new work.

The committee also call attention to the great evil which results from the use of what are called over-sizes of screws. The views of the members of the association in relation thereto are expressed in the following resolution, which was adopted at their last meeting:

"This association deprecates the use of screws larger or smaller in diameter by a small fraction of an inch than the sizes specified for the Sellers' or Frankiln Institute systems, and all its members are urged to abandon entirely the use of all over or under-size screws."

If railroad companies have not already adopted this system, they are advised to do so, at least for all new work, and to compare their gauges with the Pratt & Whitney Company's gauges, which have been declared the standard of measurement of screw-threads by the Master Car Builders' Association.

Machines for Making Wall Paper.

One of the effects of the general introduction of automatic machinery into the various industrial and artistic processes is to make common, by cheapening the cost of production, things that are not considered as among the necessities of life. As illustrative of this, we present, by permission of Fr. Beck & Co., some of the machines used by them in the manufacture of wall paper, at their extensive manufactory on Seventh avenue, corner of 29th street, New York City, where they occupy in this business a floor space of about two and one-half acres.

The plain paper which is used comes to the factory in large rolls from the manufacturer, and in different grades, particularly as to weight or thickness, to serve the different purposes, some of it being destined to leave the factory in rolls of eight yards, worth as much as twelve dollars per roll, while some of it will be sold as low as twenty-five cents, or even less per roll.

The first operation through which the paper passes in the process of converting it from the plain roll to the artistically-finished product is one in which the surface receives the ground or neutral tint. This is done in the machine represented in Fig. 1, through which the paper passes direct from the large rolls, two widths simultaneously. The color, whatever the design may call for, is applied to the paper as it passes rapidly through the machine by the large roller brush seen in the engraving (the color being in the trough below the brush), and is distributed evenly by the series of brushes shown at the circumference of the large cylinder, in advance of the roller brush. These brushes are by suitable mechanical appliances given a vibratory motion, producing the effect of intelligent hand-work with great rapidity, so that as the paper leaves the machine the ground color is regularly laid.

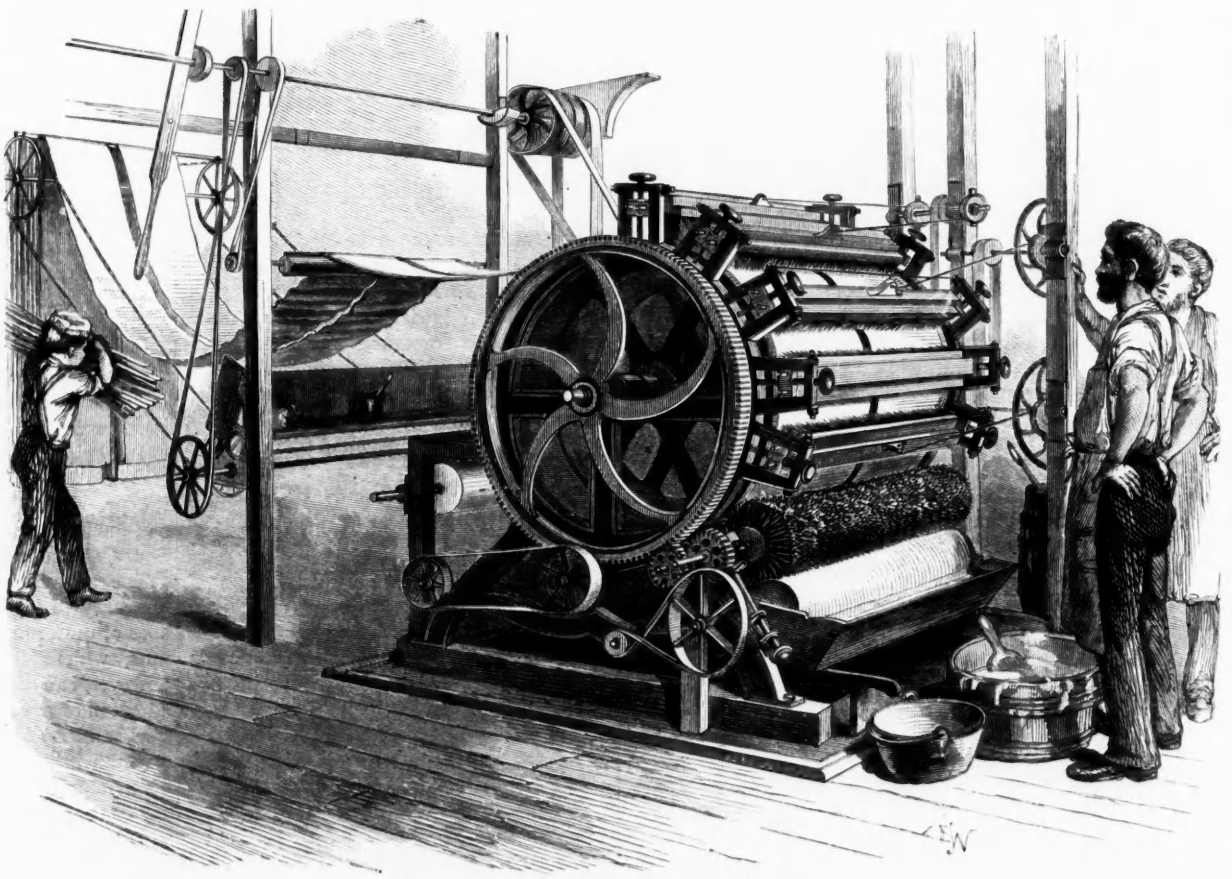


FIG 1.—WALL PAPER GROUNDING MACHINE.

As the paper leaves the grounding machine it is caught up in long loops or festoons and carried slowly by an endless chain movement, a distance of some hundreds of feet, over steam drying pipes, by which time it is thoroughly dried and is again wound in rolls ready for printing.

Fig. 2 represents a machine for printing in twelve distinct colors, built by John Waldron, New Brunswick, N. J., of which others of the same general construction for printing in eight and a less number of colors are also used. To this machine the roll of paper upon which the ground is finished, next goes and is mounted at the left hand end. Each of the colors to be printed requires a separate roller upon which the particular part of the design to be printed in the color represented by that roller is worked in brass or bronze.

The location of these rollers with reference to the large cylinder may be inferred by the position of the pinions shown gearing with the large spur wheel on the cylinder shaft. Each of these rollers is provided with a trough containing the requisite color, which is distributed to the roller in its revolution. The paper from the roll is fed into the machine and over the large roller, in its progress coming successively in contact with each of the small pattern rollers which adds its special part of the color and pattern, so that when it leaves the machine the pattern is completed. Since, in complicated designs, one roller will add a little of its color and figure here and there, which, to complete the whole, must be supplemented by colors and figures of succeeding rollers so as to exactly join and correspond, some idea of the exactness of the feed and tension of the paper as well as the skill required in engraving and arranging the rolls may be seen. From this machine the printed paper is carried in the same way as from the grounding machine, and upon arriving at the end of the endless chain movement the sticks which support it are mechanically thrown out, and the paper, now finished and dry, falls upon a rack ready for being wound in small rolls for use.

Sometimes the design calls for gold or other metal in the pattern, in which case that particular part is printed in varnish, and in the progress of the paper over the drying pipes and at a point where the colors are sufficiently dry not to attract the dust it is applied and is taken up by the varnish which is not yet dry.

Fig. 3 illustrates hand-printing which is employed to some extent on special patterns where the quantity wanted will not warrant the expense of constructing the costly rollers necessary for its production. It is also of interest as representing the advantage of the use of machinery in this industry. In hand printing the design is made on flat blocks which, in use are suspended as shown in the engraving. The paper to be printed is passed over a form, the operator applies the face of the block to a sheet upon which the color is distributed and then applies the block to the paper, pressing it down firmly by means of a foot lever; and so on with one color, repeating the entire operation for each color used. Very fine work is done in this way, although it would be difficult to conceive of a greater contrast than that between the uncertain and repeated motion of the paper in hand printing, resulting in costly product, and the rapid and certain motion in machine printing, resulting in artistically designed and colored products at a cost merely nominal.

The Engineers' Association of Rhode Island (Henry D. Cozens, Secretary, New Court-House, Providence) desires to correspond with all societies of stationary engineers in the United States, with a view to mutual assistance in their occupation, and to organize a grand national lodge. There are quite a number of societies of the kind in this country (three or four being in New York City and vicinity). The project seems to be a good one, and one which, if properly carried out, is calculated to elevate engineers and their occupation.

A New Industry in Syracuse.

A company, known as the Solvay Process Company, are establishing at Syracuse, N. Y., a plant for the manufacture of Carbonate of Soda, the first one of the kind in this country. In the economical manufacture of this product two things are required in abundance, viz. lime and salt water. Both of these are readily obtained at Syracuse, lime-stone being in abundance, while salt water can be had by boring in the proper localities to a depth of about 400 feet, the water rising to within ten feet of the surface. The company will get the water four miles from the works, conveying it through 8" cast-iron pipes, using a steam pump at the wells. The water used in the manufacture must contain salt up to saturation, while the water from the wells contains only about 65 per cent. of the necessary quantity. To bring it to saturation, evaporation has to be resorted to, or more salt added, the latter plan being the one adopted. For this purpose it is delivered in tanks at the works where the salt is added and the saturated water treated with ammonia, after which it is pumped into cast-iron tanks, of which four are used, each 70 feet high and 6 feet diameter, made up of short cast-iron sections, flanged and bolted together.

Lime is burned on the grounds in covered kilns. From the top of these kilns the gas is taken by an air compressor, and after being drawn through three washers, in each of which it passes through 12 inches of water to wash and cool it, it is compressed and forced into the bottom of the tanks containing the salt water, through which it passes to the surface (a distance of 70 feet vertically). In the tanks, and a few feet apart, are perforated baffle plates, which serve to bring the gas into intimate contact with the water. In the passage of the gas through the water, by chemical combination, the product sought, carbonate of soda, and also chloride of ammonia result. To free the ammonia the chloride is treated with lime, produced in the kilns, and the ammonia saved for further use.

Boilers aggregating 800 horse power will be furnished by the Babcock & Wilcox Co. of New York. These boilers will be set with an air conduit in front, into which air for combustion will be forced by a fan blower, the products of combustion passing to the chimney—175 feet in height—through a similar rear conduit.

The compressor, which is being built by the Straight Line Engine Co., has two upright over-head compression cylinders, each 36" × 36," connected to cranks on a shaft below, to which are also connected the two horizontal steam cylinders, each 26" × 36." The relative position of the steam and compression cylinders is thus such that the steam cylinders are at their best with reference to steam pressure at the time when the compression cylinders are compressing up to the necessary tension, and delivering into the tank, while the easy part of the stroke of the compressor is accomplished by the expanding steam in the steam cylinder.

A peculiarity of the use of steam in the compressor is one that has already received some attention, and will undoubtedly receive more in the future than in the past. This may be referred to by saying that in the processes of manufacture steam in large quantities, at about twenty pounds pressure (above atmosphere), is required. To furnish this the steam from the steam cylinders will be exhausted at that pressure, and used for the purposes referred to. By this plan the heat actually lost in the steam cylinders is greatly reduced.

The pistons of the steam cylinders being horizontal, about 90 per cent. of their weight is held from the bottom of the cylinder by steam shoes; that is, a cavity in the lower surface of each piston is kept filled with steam at boiler pressure, and exerts a constant force to lift the piston against gravity. To provide for filling this cavity, the piston rod is drilled from the outer end to a sufficient depth, and a small pipe from the boiler or main steam pipe passes through the cylinder head, to which it is attached by means of a ball-and socket connection. This pipe extends into the hole in the piston rod such a distance that the inner end will not be uncovered by the forward stroke of the piston. The hole in the piston rod is larger than the pipe, and a connection between this hole and the pocket in the piston keeps the latter supplied with steam. The outer end of the hole in the piston rod is packed against the pipe by means of a babbitt bush.

These compressors will be arranged so that the speed can be varied at will, but still under control of the governor.

The works of the company are in a good state of progress, and will cost, when complete, probably not less than $500,000. Some idea of the inducements for engaging in this enterprise may be had from the fact that in 1880 no less than 180,000 tons of carbonate of soda were imported. The company will, when the present works are completed, be able to produce from fifteen to twenty tons per day, but have room for extending their works indefinitely.

A lazy man near Fort Smith, Ark., abandoned a well after digging four feet. The man who bought the farm dug down another foot and struck a vein of coal worth thousands of dollars.

"How long will that lathe turn?" asked the Superintendent of a railroad upon which the shop men had been recently put on short time. "Seven hours and a-half" was the prompt reply of the man who kept it turning.

Cotton and paper, both quite combustible, are highly spoken of for fire-proof construction, paper pulp being already used for making doors.

Emory W. Mills.

Emory W. Mills, who has probably done more in this country to improve and perfect the portable steam engine than any other single individual, died in New York, May 20th, 1882, of Bright's disease, after a long illness, in his fortieth year.

In November, 1877, at the trial of agricultural steam engines, held at Syracuse, N.Y., by the New York State Agricultural Society, ten engines, rated at from four to ten horse power, were entered by different persons and firms, the Mills engine being awarded the first prize for the best portable steam engine, of the first class, for agricultural purposes.

The judges say, "that the design of the Mills engine shows careful and intelligent study, and a rare appreciation of the principles involved in the construction of the steam engine, and that the mechanical execution of the design is unexceptionable."

They say further: "It is proper to add that the conclusions thus reached, by a systematic and rigid scientific discussion of the results of the trial of the engines of the first class, are in exact accordance with our individual personal impressions at the end of the trial."

Mr. Mills was one of those extraordinary men whose acquaintance required time to develop, but to know him was to appreciate and respect him.

Had he lived, his continued effort would doubtless have been exerted in the improvement of the specialty in which he has given evidence of excellent ability and decided promise. W. BARNET LE VAN.

Philadelphia, Aug. 19, 1882.

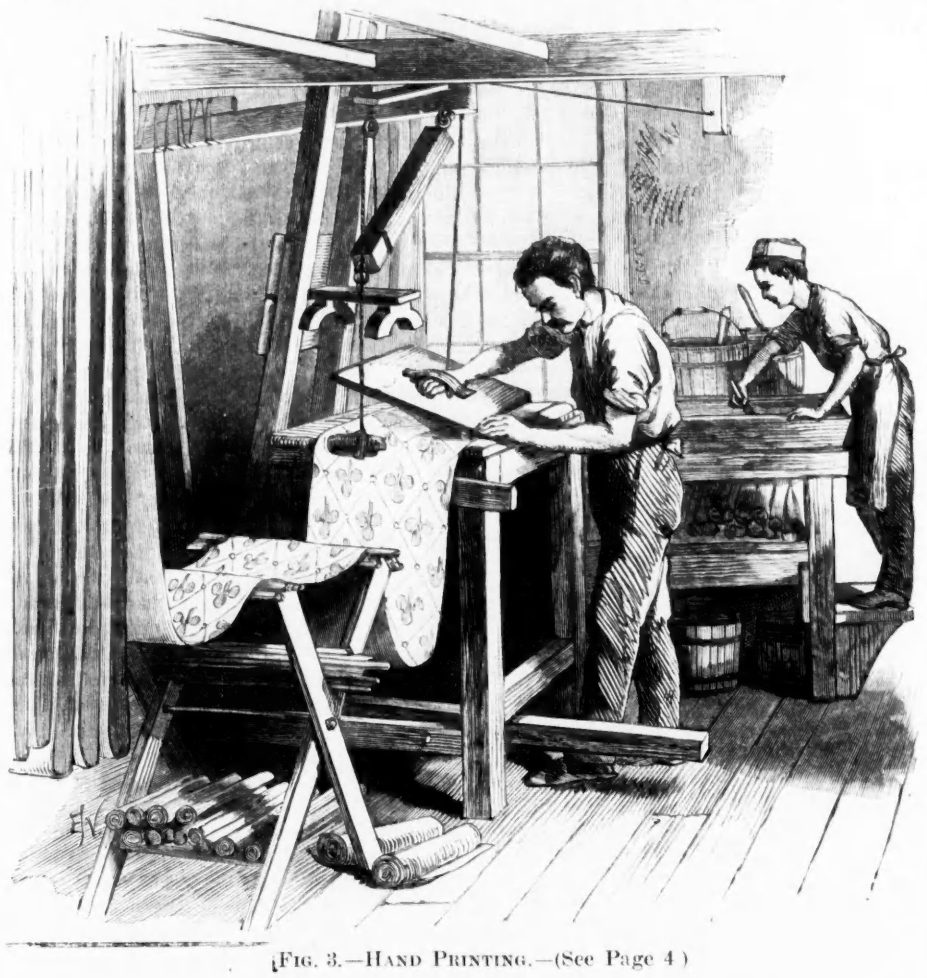


FIG. 3.—HAND PRINTING.—(See Page 4.)

LETTERS FROM PRACTICAL MEN.

Cutting an Annular Gear.

Editor American Machinist:

Some time since a new 60″ engine lathe was purchased, erected and put to work. It was a well-designed machine—no circumlocution about it, but every part adapted to the function required. Much was expected from such an admirable tool, but the result was disappointment. This lathe had its cone on shaft at one side of spindle, and drove by spur gear on this shaft, running in an annular gear on face plate. Plate and gear were cast in one piece. All other gears on the machine, including the one driving the annular gear, were cut in the best manner from solid blanks. This annular gear, with its cast teeth, ruined the lathe for business. "Cuss words" were freely used, but did not improve the work turned out from this machine. Something must be done, and the something meant a cut annular gear in place of the one on the lathe. But how could this be done? The face plate was 5′ diameter, or full swing of lathe; number of teeth in annular gear, 112, or 2 per inch, which gave a pitch diameter of 56″, and diameter at bottom of teeth of 57.31″. Plainly, the gear rim could not be cut off the plate and a new one bolted on, for the lathe was not designed for this. The only thing to do was to get out a new face plate with a blank gear on it, and cut the teeth from the solid iron. The various machine shops with which we were familiar were thought over, and it was decided that none were especially fitted for this particular job. So the home equipment was looked over, until a fine 18″ stroke 6′ slotting machine stopped further investigation. This was a modern machine, with longitudinal, transverse and circular movements of table, the latter accomplished by gear and tangent screw, familiarly known as "worm gear and worm." It is ascertained that the required diameter of gear can be cut on this machine. It is necessary to divide the same accurately, so the worm gear by which the table has its circular movement is tested for its dividing qualities as follows: A pulley 4′ diameter, nicely turned, is centered on the table and secured; the worm shaft arranged with stop for crank; a good straight edge fastened to some convenient part other than table, so it just clears face of pulley; a line scratched on face of pulley, the straight edge forming guide for scratch awl. This is continued until table and pulley have completed one revolution. A pair of dividers, with sharp, clean points, test the equality of the divisions so made on face of pulley. So far it is satisfactory. The worm gear on table has 142 teeth, the gear to be cut will have 112 teeth. So an index wheel of 112 teeth or notches, is fitted and fastened to worm shaft in the place where the usual gear for rotary feed of table is found. A pawl, or detent with its ends fitted to the spaces between teeth on index wheel is hung to some convenient and substantial part of machine. The new face plate for the lathe with its blank annular gear, bored and turned to dimensions (not forgetting to make an undercut at inner end of tooth so the cutting tool will run into space at end of cut) is now centered on table of slotter and firmly secured to same.

Two cutting tools have been prepared; the first is simply an ordinary slotting tool with a width at cutting point equal to the narrowest part of space between teeth, and is to cut away the bulk of the stock. The second and last tool is carefully filed to exact shape and size of said space, and tempered. It is necessary for each of these tools in their turn to cut 112 spaces 1.15″ deep each, without removing them from the ram or slider in which they are secured. Therefore, in the operation of cutting, the tool is relieved on its upward stroke; that is, as soon as the tool has performed its cutting or downward stroke, the operator turns the feed screw in the direction that will move the work away from the tool enough to prevent any drag of tool on its upward stroke. This prevents wearing of edge of tool except what is due to the cutting of the metal. The operator must have a good eye and judgment. The gauge for depth of each cut is the position of feed crank which, at end of each down stroke, must be moved back far enough to prevent drag of tool and at top of stroke forward of its last cutting position enough for proper cut for the succeeding down stroke.

For the divisions the 112 index wheel is moved 142 teeth, or one revolution, and 30 teeth over.

I have now, on paper, completed the cutting of an annular gear. The operation here described was actually performed some time since, and with a result that is perfectly satisfactory. The time consumed cutting this gear from the solid blank was 45 hours. This may not be a new way to cut such gears, but it is certainly not a common one, and is offered here more for the benefit of the young generation of machinists, than for the old "chips" who have worked three or four decades at the trade.

A. S. ALDEN.

Holyoke, Mass.

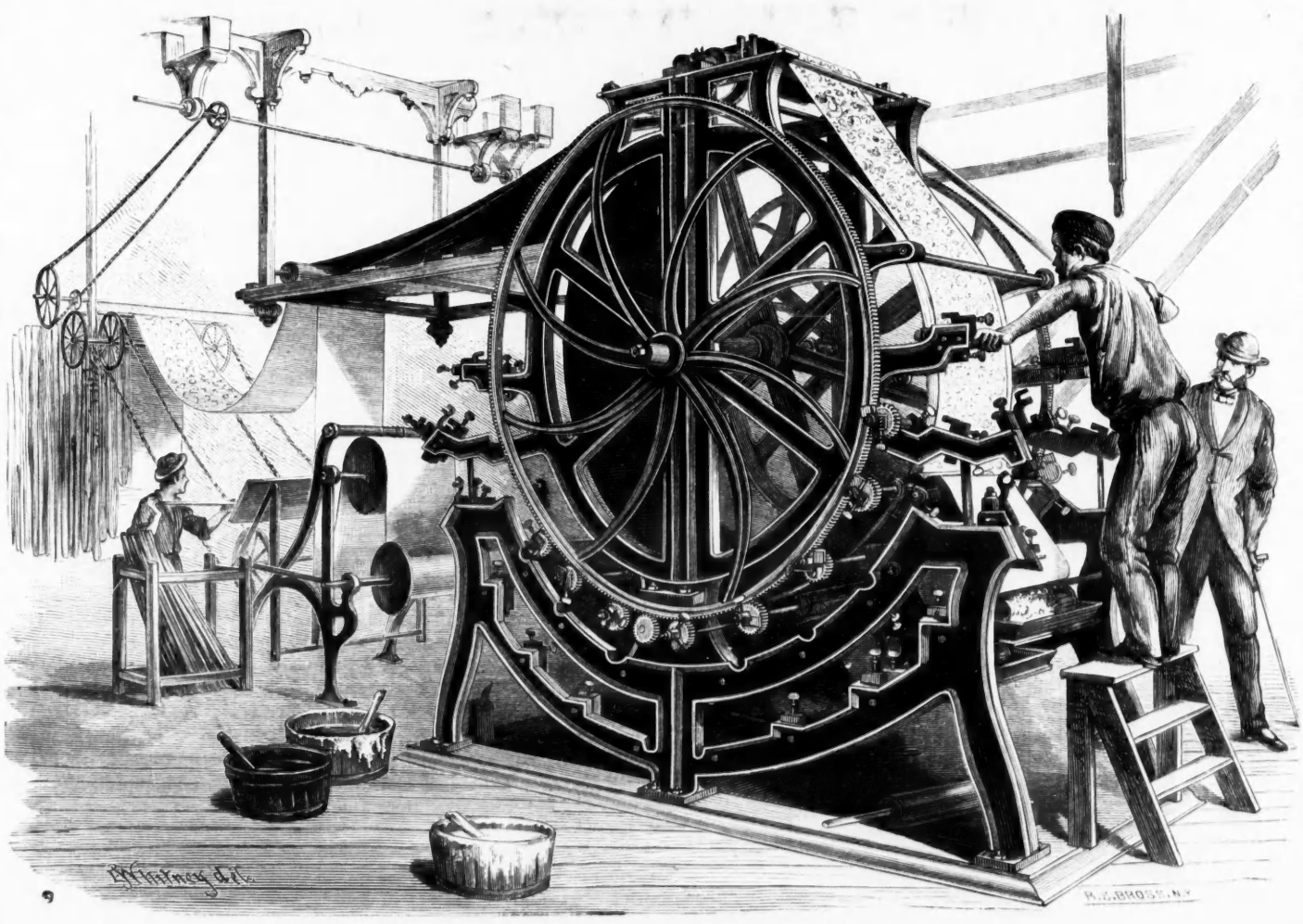


FIG. 2.—WALL PAPER PRINTING MACHINE.

Larger Micrometer Caliper Wanted.

Editor American Machinist:

In reading last week's issue of your valuable paper, I note with interest a gentleman speaking of the micrometer caliper as a substitute for slide gauges, and I am also highly pleased to see that he is asking for a 2″ caliper, which I have asked for many times. They are indispensable in a tool room for ac-

curate measurement, and a splendid substitute for the Vernier caliper, and those who have been using them know their worth.

I have a micrometer caliper which I purchased at a tool store, that measures from one inch to two inches; but it costs too much to come into general use in shops.

Cleveland, O. TOOL MAKER.

Wanted, A Foreman.

Editor American Machinist:

As your valuable paper is evidently a general exchange for the collection and distribution of inquiries and answers, please let me state my trouble, and see who can help me out.

My name is Hunt; Reginald Augustus Hunt. My father is a wealthy banker, and I was well educated, taking the classical course at Harvard. But on my return from a summer in Europe, I fell in love with the big engine on the Celtic; and at once resolved to devote myself to mechanical pursuits, being sure that with my superior education, I would make short work of mastering a business that is only learned, I am told, by your greasy, "practical" men, in a lifetime.

And so my father bought me the Star Iron Works; a machine shop, with a foundry, employing about 100 men, and doing a large business in building and repairing engines and mill machinery for the surrounding country. Old Mr. Webb, who started the thing forty years ago, got rich there, and was ready to quit. He is an illiterate man; and if he could make money at it, how much more could I do, with my superior advantages.

Mr. Webb introduced me to the foreman, Dunn. He said that Dunn took entire charge of the shops, and he himself had of late years done nothing but office work. But how Webb treated him! Here, thought I, old man, is one of your mistakes. Got to have a foreman, of course; a good, responsible man; but you must make him know his place, and not treat him like Webb did, just as though he were an equal. However, Webb is nothing but a mechanic himself. I'll show Mr. Dunn that he has a different man to deal with now.

I wanted to learn all about the business, and so I talked much with the hands; and as I encouraged them to speak their minds freely, without fear of Dunn, I soon heard a good many things that made me dissatisfied with him. All the oldest and highest priced men seemed to be in league with him; I could never get a word of criticism from them. But two young fellows, who had worked in nine or ten different shops within three years, and were therefore more experienced, were honest with me, and told me many things to his discredit. I asked them to watch him closely, and to advise me, privately, of his doings.

Before long Dunn discharged one of these men, Todd, who appealed his case to me. As he was my favorite, I told him to go back into the shop, to work. Pretty soon Dunn came to the office, gave me his keys and books, and left. I was glad.

I at once told Todd to take his place, and that night, I heard, he became seriously intoxicated. I was disappointed in him, and reluctantly let him go. But he was a good-hearted fellow.

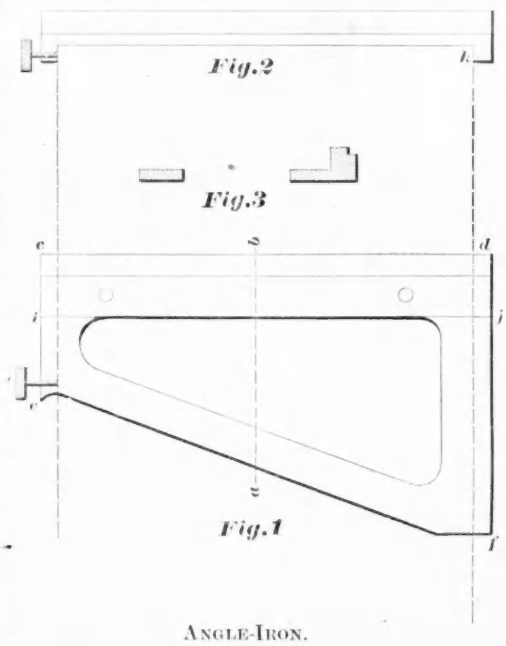
Lee came a week later, well recommended, came from Hartford. My cousin's oldest boy, who is in the office, soon reported that he didn't like Lee, neither did the men. I privately questioned some of them, and found they thought him too strict, and too exact in his notions about the work. The old hands had nothing to say. They seemed to have some mysterious object in sticking to the foreman. Still, I think they didn't like Todd much. Well, Lee didn't stay. When he found I was canvassing the men, he was angry and impudent, and I discharged him.

His successor seemed to think he owned the whole place. I wanted him to provide a job for one of my father's tenants, and he wouldn't keep him. I told him I proposed to have some say in the management of my own business, and he might do as I told him, or go.

We had a big engine contract on hand; and the next foreman, Alderson, hadn't been here three days when he wanted to see the itemized estimates of cost, that Dunn had made, and the account of work and material already expended on the job. Said he wanted to know where he stood, and how much leeway he had. I told him that was my private business. What I wanted him for was to stay in the shop, and not meddle with the office. He quit.

To shorten a long, sad story, I have had miserable luck in the kind of men I have had for foremen—seven of them in three years. They all seem alike—determined, independent, and I might say insolent—all but poor Todd. I lost money on the engine contract, and have had no end of fights and trouble with customers, through the faults, and frequent changes, of these men. All the best hands have gone away to Dunn and Lee. No one here now can tell, since the head moulder left, what the different patterns in the loft are for; and I am nearly wild with trouble every day, over this matter alone. Lots of my customers have taken their own mill patterns away. Everything is out of joint. Can't some of your readers recommend a man who will suit me? I want a faithful, diligent person, who will be responsible for the management of the shop, and yet do just as I tell him, and not want to have his own way.

Wyckoffville. R. A. HUNT.

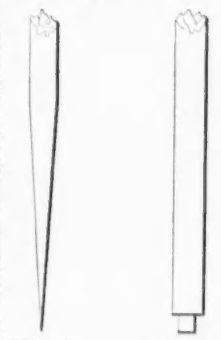


ANGLE-IRON.

An Angle Iron to go on any Planer.

Editor American Machinist:

In your issue of August 12th, Mr. Lyne gives a description of an angle iron for a planer that calls for that climax of all nuisances; a receptacle of chips and other small stuff that help to throw work out of true; that is, a slot in the center of the platen. As I have always been opposed to any recess in the platen that does not go all the way through, allow me to submit an angle iron that will go on any platen that has one straight edge. Referring to Fig. 1, have the side $d\,f$ $\frac{2}{3}$ of $d\,e$, and the side $e\,e$ $\frac{1}{3}$, so that the set screw g will be opposite the center of $d\,f$, so that when tightened it will bring both ends of $d\,f$ up against the edge of the platen.



POINTING SPINDLES.

Now if the side $d\,f$, shown at h, Fig. 2, is planed perfectly square with the side $d\,e$, you have a self-adjusting angle iron that will fit any platen of the same width, or a little less than the same width.

By cutting the pattern off at the dotted line $i\,j$, you will have an auxiliary plate that will, along with the other, do for a chuck to hold work. Fig. 3 is a section across $a\,b$. These attachments can be used to advantage on a milling machine. F. C. D.

Dundas, Ont.

Weighting Down Copes—Spindles.

Editor American Machinist:

In reading the article by Mr. West in your issue of July 22d, "Weighting Down Copes," I was surprised to find the assertion, in effect, that no rule could be given that could be used with any certainty of success. It seems to me to be a question of hydraulics—nothing more. I have never discovered in my experience the least evidence of the blow or concussion Mr. West speaks of, and in my opinion nothing of the kind occurs. If when you are filling a mould you have plenty of iron, and pour fast, with runners high and choked, the interval between the mould just full and the building up a high head from 4″ to 12″, is so short that the iron may appear to strike the cope with considerable force, but such is not the case. If the cope lifts, it simply floats on the liquid iron. As there is $5\frac{1}{2}$ ounces of pressure for every inch in height and square inch of surface, and as it takes but a moment after the mould is full to run up a high head in the risers, the pressure comes somewhat sudden, but by no means in the nature of a blow.

A rule I have used for the last 15 years for weighting copes has proved very useful, and entirely reliable. This is my way, and I submit it to criticism. If it is wrong I will thank any one to correct the error. I assume 32 feet in height to equal 16 pounds water pressure; then 16 feet equals 8 pounds and 8 feet equals 4 pounds. Iron is 7.8 times heavier than water, so for 8 feet high, or 4 pounds of water, the corresponding pressure of iron would be 4 pounds multiplied by 7.8, equals 31.2 pounds. Four feet head would be one-half as much, or 15.6 pounds; 2 feet, one-half this latter quantity, or 7.8 pounds; 1 foot, one-half this or 3.9 pounds, and 6″ head would equal 1.9 or say 2 pounds. There is a certain method in this way of reckoning, as it enables the busy foundryman who hasn't time to use pencil and paper, to make the calculations in his head. All displacement of cores must be computed according to depth, etc.

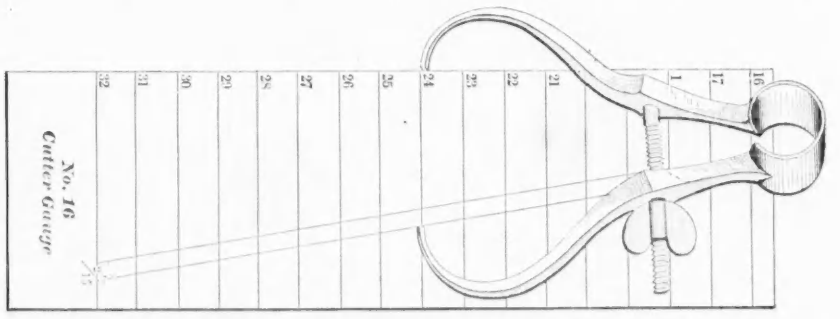
This does not take into account the weight of cope, which thus becomes a factor of safety. The weight of cope may be taken out if desired, but life is too short to make long calculations in a foundry when the wind is on and the iron melting.

There is one little matter besides, I would like to mention, and that is the point of Mr. West's spindle, as shown in a recent issue of the AMERICAN MACHINIST. Seriously, I don't believe Mr. West ever used such a spindle. The fault may be the engravers but some inexperienced individual will follow the cut and make a spindle that he will get through his foot some day.

A much better way than the one then shown, and which is represented in Fig. 1, is the plan represented in Fig. 2. This is the oldest one I know of, and was in use when I was an apprentice. It can be made of wrought iron tubing, and from its antiquity may with propriety, for all I know, be called Tubal Cain's style.

L. C. JEWETT.

Yonkers, N. Y.



Diametrical and Chordal Pitch—Gauge for use in Cutting Gears.

Editor American Machinist:

Mr. Richards, through the AMERICAN MACHINIST of Aug. 12, puts a pertinent question relating to pitch of gear wheels. It is: "Why are toothed wheels pitched by their perimeter instead of by their diameter?"

Now the information, and a reference to a celebrated English geometrician that follows this proposition, all interspersed with corolaries from the main question, implies that Mr. Richards knows more about this subject than is indicated literally in his preface. He appears to me to be scolding us unlettered old fogies, for hindering the introduction of pure mathematics into the machine shop. For myself I am not inclined to do so, but desire through your columns to forward the ostensible purpose of your contributors, namely, "draw out discussion."

Suppose for a given duty a millwright requires a gear 48 inches diameter at the pitch circle, and the tooth to have the requisite strength must be one inch thick, or say 2-inch peripheral pitch, it would have

$$\frac{\text{cir. of } 48'' \text{ circle}}{2} = 75$$

teeth, and a fraction over. But suppose we make it 75 teeth and see what the exact pitch is. Thus,

$$\frac{150.7968}{75} = 2.0105'',$$

which is the length of the arc from centre to centre of two adjacent teeth. We set our dividers at 2″, which will perhaps span the chord of the arc within an almost inappreciable fraction. But unless it is exact it will not do; for a mathematical fact is positively inelastic. Our old-fashioned "near enough" is not admissible.

Now shall we be better suited either mechanically or mathematically considered by using the diametrical pitch for millgearing?

The above requirements remaining the same, what would the diametrical pitch be called? In other words, how many teeth would this wheel have per inch of its diameter?

Evidently $\frac{75}{48} = 1.5625$ or $1\frac{9}{16}$ pitch.

If, however, the requirements allow of varying the number of teeth for any given diameter of pitch circle, and making the face wider to compensate for thinning the teeth, then in the example of the 48-inch gear, we might make the number of teeth double the number of diametrical inches, thus making the pitch 2, or by varying still less in the other direction, make the number of teeth 72 and the pitch $1\frac{1}{2}$″. But suppose a pattern is to be made, as the wheel under consideration is supposed to be a cast gear, as distinguished from one cut from a blank in a gear cutter, we have still to come back to the spacing with the dividers, and must get the real pitch or rather the "polygonal division," as Mr. Richards calls it. This is most readily done by dividing 3.1416 by the diametrical pitch, giving

$$\frac{3.1416}{2} = 1.5708$$

as the real circular pitch for 66 teeth, and

$$\frac{3.1416}{1.5} = 2.09444+$$

as that for the 72 teeth; so that it is difficult in my view of the case to see the advantage, while I believe it would be found inconvenient, and tend to complicate our already indefinite and complex shop nomenclature, since the term "pitch" usually means distance from center to center of bolts, rivets and the like, as well as teeth of mill gears.

Forty years ago, when the celebrated Swiss engineer, John G. Bodmer, at Manchester, England, according to Mr. Richards, had proposed the method of basing the pitch of wheels on their diameter, a Yankee was trying to teach a boy in a Rhode Island cotton mill repair shop how to cut small gears. The principles laid down the

boy was too young to understand, but the methods were firmly fixed in his mind.

Bright tin plates of good length were ruled with parallel lines, one plate for each pitch, and one line for each tooth, and numbered on the left hand. The plates ran from 5 to 24 pitch, and were made to indicate the pitch diameter, and also the whole diameter for any number of teeth found at the left hand. Thus referring to No. 16 plate as an example, the left edge of the plate being true and straight, one inch was laid off on the first line marked 16, and $\frac{3}{16}$ of an inch was laid off to the right of this inch. Upon the line below marked 32, two inches and also $\frac{3}{16}$ were pointed off, and so on every 16th line down the page an inch is added and the constant $\frac{3}{16}$. Or its equivalent. Taking the line marked 96 and laying off the 6 inches and the constant $\frac{3}{16}$, and joining these marks to the marks on the first line, No. 16 plate is complete.

For No. 5 plate the constant is $\frac{3}{8}$, and for No. 10 it is $\frac{3}{18}$, etc. But for obvious reasons the coarser pitches are not practicable as small as one inch diameter, so that each plate must begin with not less than a practicable number for that pitch. The distance apart of the oblique lines gives the depth to cut the teeth, and the whole diameter of the blank is taken by the calipers from the left edge of the plate to the right hand oblique line, shown in sketch for 24 teeth, 16 pitch. Upon the edge of the plate is usually cut a gauge by which to turn the cutter for the pitch.

S. N. HARTWELL.

Hardening by Pressure.

Editor American Machinist:

Will you permit me to ask a few questions through your columns in relation to the recent discovery that steel may be hardened by compression? For several months past there has been going the rounds of scientific and mechanical journals, the statement that heating steel to a cherry-red and submitting it to pressure until cold would have the effect of hardening it. From a recent issue of a prominent mechanical paper I read that "M. L. Clemandot has given the name of tempering by compression," to this method. In another journal of like character, is a communication from a "Down East" mechanic who says in substance, that tempering by pressure, while it may not be generally known in this country, is not new. That he has used it for the last four years. In his case it was the result of experiment. It excels every other method he has tried. Succeeds admirably—straight as any straightedge, and so hard that a file will not touch it; carelessly dropping it on the floor will break it in fragments. This testimony is in relation to thin sheet steel, No. 24 gauge, 2" wide by 12" long being mentioned.

That the steel is hardened no one having had experience in treating steel will deny, but I wish to ask if it is not perfectly plain that the hardening is due to precisely the same thing as when the heated steel is suddenly cooled by being plunged in water or other cooling medium?

It is not new. Among the things that I learned quite early in life—while still in my teens—was the strange fact (at first) that, while the proper thing to do in hardening steel was to heat and plunge in water or oil, to lay a thin piece which was liable to spring on a level of *cold metal*, and suddenly lay upon the upper surface of the piece to be hardened a piece of metal also *cold*, would have the effect of not only hardening the piece treated, but, if the two surfaces were level between which it was suddenly placed, it would be kept perfectly level. Are there not thousands of mechanics who have hardened small saws and other thin pieces of steel by laying them when heated on the bottom level die of a drop, and letting the slightly-raised upper die suddenly fall? Does the so-called "tempering by pressure" harden a piece of steel of any considerable size "clear through," any more than plunging a piece of the same size at proper heat in cold water would do? If it does not, will the discoverer tell why?

Would a two-inch cube of steel heated to cherry red, or any other heat short of scintillation, if put under pressure with an inch, or even a half-inch thickness of steel or iron, heated to a red heat, intervening on all sides between it and the mould or form used in applying the pressure, become hard? If not, why?

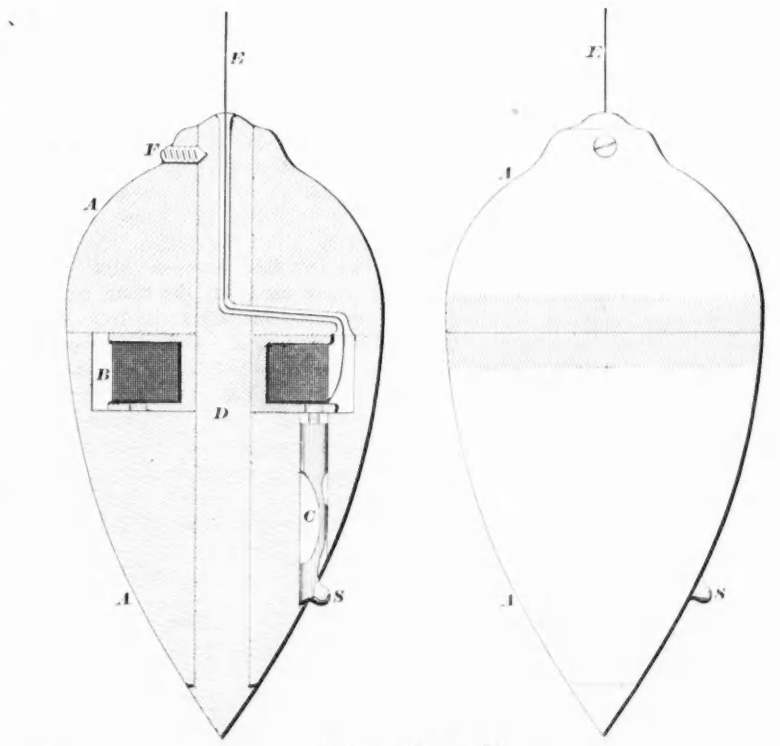
That steel is rendered more dense and *comparatively* harder by subjecting it to pressure when heated is true; all hot working properly conducted shows this. But to *harden* steel, as this term is generally understood, involves sudden cooling from a proper heat. If *contact with cold metallic surfaces* of suitable shape produces this result, why not recognize the fact, instead of calling it "tempering by pressure"?

Have not mechanics in every-day practice abundance of proof in the accidental cases of hardening, that a sudden change of temperature is the cause? When pieces of steel known to be soft have their surfaces or edges made so hard that they cannot be filed, by contact with an emery wheel, or by contact with a dull tool or cutter in turning, planing or milling (in fact any friction surface become excessively hard), is it not plain that the cause is the sudden cooling at the time the friction ceases? In such cases the cooling influence of the atmosphere (from the fact that the heat by friction is usually superficial, the interior portion of the metal not becoming heated) is sufficient.

Is it not well known among mechanics that those processes of working metals cold, which generate the most heat by friction, have a very perceptible hardening effect; while in those operations where there is no apparent heat produced the increase in hardness is not perceptible, although the change in shape or volume has been considerable? Will not "tempering by pressure" come under the same head with "annealing by heating to a red heat and plunging in boiling water," a trial of which will convince the most credulous that it is a low grade of tempering, not annealing? Or, with the more widely known, but no less deceptive so-called "cold water annealing," which, while it anneals, can be easily proven to be only a comparative degree of annealing, never, as its advocates claim for it, making steel softer than any other method?

S. W. GOODYEAR.

Waterbury, Conn.



A NEW PLUMB BOB.

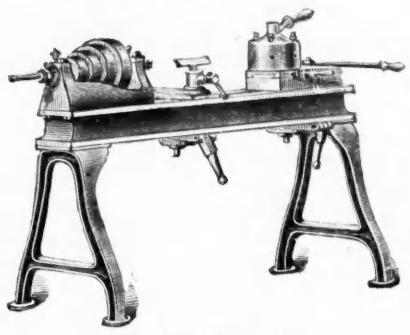
Battery of Boilers.

Editor American Machinist:

Did you not mistake the import of the "battery of boilers" letter, in your issue of August 26?

Mr. Le Van does not say what the expression should be. He seems to be seeking information, and has been looking in the dictionary, but does not find it. It is a common thing amongst engineers, to say "battery of boilers," or to designate them as No. 1 battery, No. 2 battery, and so on. The expression has been in use for the past twenty-eight years to my certain knowledge. It may be surprising that a boiler builder should not understand it, but I have known a machinist who could not understand what it was that drove the piston through the cylinder head when the crank-pin let go.

My dictionary gives seven definitions of the word "battery," and it does not say anything about battery of boilers, Battery Place in New York, nor the duck-shooting battery of Chesapeake Bay. Neither does it anywhere give the definitions of flue boilers, tubular boilers, starting-bar, nor cut-off; and when a man does not know these things, and cannot find them in the dictionary, of course he must apply *somewhere* for information. Who *is* authority in such matters? S. P.



TURRET LATHE.

Thirteen-inch Swing Turret Lathe.

We present herewith an engraving of a small turret lathe, made by Lodge, Barker & Co., Cincinnati, O.

This lathe is designed and put upon the market as a special tool. It has sufficient power for tapping brass work up to 1 inch pipe tap, and for such work as valves, compression cocks, lubricators, &c., will, it is claimed, do just as good work, and as quickly, as a more expensive tool. The front bearing is 2 inches in diameter and 3 inches long. The cone pulley has four speeds for 2 inch belt, or three speeds for 2½ inch belt. Turret is 6 inches in diameter and has convenience for five tools, any of which may be 5 inches in diameter; has 4 foot bed, and swings 13 inches. The slide is gibbed on both sides to insure keeping turret central, and has 6 inch stroke.

Although this lathe is designed more particularly for brass finishers, it may be advantageously used for other classes of work which are made in quantities, and on which the various operations must be quickly performed.

The spindle is pierced with a ¾" hole for working up long stock. The spindle is steel, and all sliding surfaces are fitted by scraping according to the best modern practice. Accompanying each machine are a hand-rest and a counter shaft with back and forward motion

A New Plumb-bob.

We present herewith an elevation and section of a new plumb-bob, the design of B. F. Chappell, of South Windham, Mass. By reference to the engraving it will be seen that the outside or shell of this bob is made in two sections, *A*, *A*. Inside this shell is arranged the reel *B*, upon which the cord *E* is wound, the arrangement being such that as much of the cord as is required for use may be readily wound and unwound. To accomplish this, the two parts of the shell are pierced with a central hole, to which is fitted the stem *D*, extending entirely through the shell, the lower end being fashioned into a point for the bob.

A hole in this stem allows the cord *E* to pass into the interior of the stem and to the reel on which it is wound. In the upper part of the shell a small screw *F* serves to lock the upper section to the stem, and the upper and lower sections together.

When not in use, the cord is secured to the reel, which is held from turning by the stop *C*. This stop in turn is kept in the position in which it is placed by a small spring that provides the necessary friction on the side of the hole in which the stop works.

When required for use, the cord is unwound from the reel by pulling out the stop by means of the catch *S*, and by holding the lower section of the bob with one hand and pulling on the cord with the other hand. When a sufficient length of cord is unwound the stop is sprung up, which securely locks the cord.

The free part of the cord may also be lengthened for accurate adjustment by grasping one section of the bob with one hand and the other section with the other hand, and turning in opposite directions. In a similar manner by reversing the direction of motion the cord may be rapidly wound on the reel.

Flameless Combustion.

We are indebted to a Canadian gentleman, H. E. Kyle, lately returned from England, for a copy of an English publication, the *Warrington Guardian*, which has the following:

"At the soirée of the Society of Chemical Industry at Owens College, on Thursday, Aug. 8, a new theory of combustion was practically illustrated by Mr. Thomas Fletcher, of Warrington, the results being so totally unexpected that many present would, and in fact did, go away with the impression that some deception was being practised. Mr. Jacob Reese, the inventor of the Reese fusing disc, has stated his belief that if it were possible to produce combustion without flame, the temperatures and duty obtained from any fuel would be enormously increased. It has remained for Mr. Fletcher to not only prove the possibility of flameless combustion in more than one form, but also to demonstrate practically the enormously high temperature which can be obtained by this means. Taking a ball of iron wire about three pounds in weight, Mr. Fletcher placed it on a slab of fire clay, and directing a blowpipe flame on it for a few seconds he suddenly blew the flame out. The temperature increased so rapidly that in a few seconds the wrought iron fused and ran into drops, and this temperature was steadily maintained. The room was darkened, but the closest examination did not show a trace of flame, although the fact that the gas was burning was proved by repeatedly relighting and extinguishing it. The same experiment was repeated in another form by directing the flameless heat into a small fire-clay chamber, in which a refractory clay crucible, made specially for nickel melting, was partially fused and worked into a ball-like soft putty, the sides of the fire-clay chamber being at the same time fused. The heat was so tremendous that the blow-pipe laboratory, which was given up to Mr. Fletcher for the evening, was much too hot to be agreeable, in spite of open windows and ventilators. How far this discovery can be utilized remains to be seen, but it would appear that the presence of flame, usually considered to be a sign of combustion, is really an indication of imperfect results, and the best duty is to be obtained only when flame is totally absent. It is certain that such temperatures as obtained by Mr. Fletcher without flame have never previously been obtained with the fuel used, which was nothing more than a small gas supply for a quarter-inch pipe, assisted by an air blast. As regards the soirée, the society may be considered a promising infant. It is under a year old, and about seventeen hundred were present on Thursday, the building being inconveniently crowded. The meeting next year is to be in London, the president for the year being Mr. F. A. Abel, C. B., F. R. S., of the Royal Arsenal, Woolwich.

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NEW YORK, SEPT. 9, 1882.

CONTENTS.

PAGE

Small Universal Milling Machine 1
A Correction 2
A Large Shearing Machine 2
A New Propeller 2
A Jig Boring Bar for Taper Holes 2
A Mandrel Kink 3
Shop Kinks. No. 35. Handy Lathe and Planer Tools. By Lewis F. Lyne 3
Don't Be Contented 3
New Spiral Attachment to Milling Machines 3
Holding Cutters in a Boring Bar 3
Machines for Making Wall Paper 4
A New Industry in Syracuse 4
Emory W. Mills 5
Letters From Practical Men—Cutting an Annular Gear — Larger Micrometer Caliper Wanted — Wanted, A Foreman—An Angle Iron to go on any Planer—Weighting Down Copes—Spindles —Diametrical and Chordal Pitch—Gauge for Use in Cutting Gears—Hardening by Pressure —Battery of Boilers 5, 6, 7
A New Plumb Bob 7
Thirteen-inch Swing Turret Lathe 7
Flameless Combustion 7
Revival of the Apprentice System 8
Points in Setting Locomotive Slide Valves 8
The Bursting of Steam Heating Pipes 8
Literary Notes 8
Questions and Answers 9
Manufactures 9
Machinists' and Engineers' Supplies 10
Iron and Metal Review 10

Revival of the Apprentice System.

We are much pleased in going about from place to place to learn that some of the leading manufacturers and builders of steam engines are becoming fully awake to the necessity of supplying, in some way, men to fill the places made vacant every year by skilled workmen, who are leaving the shops to go into some other business that will be more remunerative. It should be borne in mind that skilled workmen do not long remain in that capacity before they become known, and have opportunities offered them to fill better and higher positions. During the past few years a number of our best and largest shops have refused, for various reasons, to take any apprentices. One of these reasons is that some of their boys, after having worked in the shop until they became familiar with the use of tools, would go away to other shops and work as journeymen. Since that time they have been making specialists by employing men and boys to do only one kind of work. This system may, and does work well under favorable circumstances, and it must be admitted that some workmen have only sufficient capacity to master one branch of work, and may even excel in that branch alone.

But in every shop workmen are needed who are capable of performing all kinds of work in their line, and of thoroughly understanding it. Such men we call natural mechanics who can be placed in the position of foreman when required, or take the place and perform the work of any workman in the shop when a temporary vacancy occurs.

We remember a shop where over a hundred workmen were employed, and one day the workman who ran the bolt cutter stayed away. Some bolts were required to be cut, yet, upon inquiry, there was found but one workman in the whole shop who knew how to put in the dies, set them and cut the bolts. This statement also illustrates the delay and difficulties which will apply to other processes and operations in shops.

We have arrived at a period where it is evident that something must be done to produce skilled workmen, and this cannot be done unless some one becomes interested. While in a shop in Pennsylvania, not long since, in going through the foundry a boy of about eighteen years of age was pointed out to us by the superintendent, who said, "That boy has a history. He came into the office one day and asked for a chance to work as an apprentice. He was dirty and ragged, so he was told that there was no place for him. He went away but in a few days returned, and in a persistent manner said that *he was going to work there.* He had looked far enough for a situation and was unsuccessful. Clothing must be had and the necessaries of life must be procured, all of which required money. By insisting upon having a situation he attracted attention, and after answering all the questions that were put to him in a straight, honest way, he was put to work in the foundry, where in a very few days he showed ambition, and now bids fair to make a first-class moulder. A short time after commencing work his shoes gave out, so he went into the office and told the book-keeper that he must have a new pair of shoes. His pay was insufficient, and some way must be devised to procure the shoes. The book-keeper, pleased with his manner, furnished him with shoes and he was satisfied."

At the present time it is necessary for a boy to almost beg his way into a shop to learn a trade, but we hope that this condition of things will not last much longer. A prosperous company who have been erecting buildings to cover a lot about 200 by 450 feet, have assured us that they intend to employ a large number of apprentices in their new shops. They have been greatly troubled to get workmen who were skilled in steam engine building, particularly in their styles, so they have resolved to raise their own workmen.

Some foremen and superintendents will be troubled with the tricks of boys. As a rule we have found in our experience that the boys who were the widest awake and the fullest of tricks and jokes eventually made the best workmen, and we believed in never interfering with the boys except they were doing some positive damage.

Many proprietors and superintendents of shops deceive themselves by thinking that boys are only a bore and not a profitable investment, when the real fault lies with themselves, either in not selecting the right kind of boys in a loose agreement, or in not treating them in a deserving manner. Some of these individuals seem to forget that they were once boys themselves and had to work hard to make any progress. Since they have made a success in business they cherish their selfish disposition by neglecting or refusing to lend their assistance to the boys in giving them a boost up the ladder.

Some of the most inconsiderate men in this respect that we have ever known were those in whom some one had taken a deep interest, and at the expenditure of time and money given them a good start in life. We believe one of the best ways to appreciate the generosity of our benefactors is to become a benefactor ourselves, and the satisfaction experienced in assisting others will more than repay for any efforts we may put forth in the endeavor to help our fellow men.

The Bursting of Steam Heating Pipes.

From the *Lynn Transcript* we learn that the citizens of Lynn, Mass., are considerably exercised over the bursting of the steam heating and power pipes of the Holly system in that city. The *Transcript* correctly reasons that although so far (there have been three explosions) the loss has been confined to the damaging of buildings and other property, serious loss of life is liable to occur at any time unless the cause is removed. Public opinion seems to a considerable extent to be against permitting the use of the pipes for high pressure steam for furnishing power, confining their use to furnishing steam, at a low pressure, for heating. A committee has been appointed to make examinations and report upon the matter, and if, as we have no reason to doubt, the members of this committee are men who are practically familiar with the questions involved, there will probably be no difficulty experienced in arriving at satisfactory conclusions, and in suggesting adequate remedies.

There is no reason why, if the work is properly done, steam pipes should not be as safe under a pressure of 150 pounds as under a pressure of 15 pounds; in other words, we fail to see that it is at all a question of pressure. If they are not safe under ordinary pressures, the fact that they are not does not go to condemn any system, but rather indicates something wrong in the carrying out of the system.

The fact that steam of high pressure is elsewhere used for the same purpose, and without the somewhat disastrous experience of the citizens of Lynn, would seem to bear out these conclusions, if argument or evidence were necessary to demonstrate that the carrying of steam long distances in pipes under-ground did not present substantially the same problem as the carrying of it equal distances above-ground, viz, the providing of the necessary strength to withstand the pressure, taking care of the expansion, and particularly taking care of the water of condensation.

Points in Setting Locomotive Slide Valves.

In setting the valves upon locomotives it has been urged that the points put upon the valve stem should be measured with a steel tram from a center punch mark upon the top of the cylinder, instead of a similar mark upon the outside of the stuffing box. The argument is that the steam chest, which is usually clamped down during the marking process, is liable to move when the clamps are removed, in which case the tram would not show the actual position of the valve. The argument is good, but we would not adopt this remedy, because the angle of the tram in measuring from the point upon the cylinder admits of too great errors, and is much more liable to introduce complications, than when the measurement is taken from the steam chest. For example, when new copper wire joints, now generally used upon locomotive steam chest joints, are applied, the valve is marked off; then, when the clamps are removed, the cover put upon the steam chest and the nuts securely tightened, the yielding of the soft copper joint will lower the steam chest. This will have the effect of shortening the distance between the points upon the valve stem and top of cylinder; then when the tram is made to fit in those points, the valve will be too far back.

The better way is, after the studs have been screwed into the cylinder and the steam chest put in place, to fit four little blocks of iron between the steam chest and studs at the four corners, close to the bottom. Then there will be no trouble from the movement of the steam chest. The center-punch marks upon the valve stem should be placed upon the side, and far enough back, so that they will not enter the stuffing box and be worn off as the valve travels. These marks can then be reliably used for months after the locomotive leaves the shop. In measuring from the guide blocks to the cross-head in taking points for the dead centers, it is better to use the valve stem tram, as dividers are liable to move, while by using the tram, the distance can be preserved and referred to as occasion may require.

Literary Notes.

THE PATTERN MAKER'S ASSISTANT, embracing Lathe Work, Branch Work, Core Work, Sweep Work, and Practical Gear Construction; the Preparation and Use of Tools, together with a large collection of Useful and Valuable Tables. Third Edition, by Joshua Rose, M.E., New York. 12mo. Cloth. 250 Illustrations. Price, $2.50.

The Pattern Maker's Assistant now contains 324 pages, filled with practical information of a character well calculated to aid apprentices and young mechanics in their pursuit of knowledge for advancement in their particular calling.

Usually the practical knowledge obtained by machinists in regard to pattern making is necessarily limited, and pattern makers are not as familiar with foundry matters as they ought to be. How often do we hear moulders complaining because the pattern maker had parted the pattern in the wrong place or the draft has been made on the wrong side!

The fact is that some pattern makers never go near the foundry, to counsel with the moulder how to save time and labor in the construction of patterns. Frequently some extra curve or corner put upon a drawing to ornament a piece of machinery will cause many extra hours work in making the pattern and the moulding.

A machinist is often required to make patterns for parts of machinery, and unless he has good judgment in reference to the shrinkage of castings, the pattern is sure to be a failure. The knowledge contained in this book has been acquired during many years of practical experience of the author and others.

The book begins with practical directions on the selection of wood, selection of proper tools and how to keep them in order. Lathes and turning together with directions on chucks and other necessary appliances occupy a prominent part of the book. Details of moulding patterns are plainly elucidated. Cores, core-boxes and pegging should be carefully read; also the chapter on wheel and pulley work, as well as that on pipe bends and lagging.

The subject of globe valves, joints and bench work, as well as gear-wheels, worm-wheels and cogging, will no doubt be perused with profit by those whom the author seeks to instruct. The book contains tables, weights and measures, arranged in a way for practical use by pattern makers and moulders. An interesting part of the book is the chapter on pipe and joint work, a branch with which every pattern maker and moulder should be familiar. The necessary machine tools for pattern makers' use are illustrated and described. Alloys and other miscellaneous information will also be found therein by the reader.

QUESTIONS & ANSWERS.

Under this head we propose to answer questions sent us, pertaining to our specialty, correctly, and according to common sense methods.

(303) W. J. T., New York, asks: Is the stroke of a piston the distance it travels in one direction, or is it the distance it travels for one revolution of the crank? *A.* It is the distance it travels in one direction, or during a half revolution of the crank.

(304) W. H. C., Quincy, Ills., asks: Can an emery belt be used for cutting and polishing iron? He says he has tried leather and ducking with common glue, but has failed. *A.* Emery belts, usually made of leather, are considerably used for polishing. Use glue of a good quality, have it hot, and press the emery into the leather with a piece of smooth board, using considerable pressure.

(305) I. L., Allegheny City, Pa., writes: Will you tell me how I can melt tinner's clippings so they will flow into a common sand mould for making coarse castings? If this cannot be done, how can they be utilized? *A.* Tinner's clippings are wrought iron covered with a thin coating of tin, and cannot be melted for castings. We know of no way to utilize them in small quantities.

(306) E. H. K., Bremen, Ohio, asks: 1. What should be the dimensions of the ports in a steam cylinder 6″ bore and 10½″ stroke; engine to run at 120 revolutions? *A.* You can make steam ports ½″x5″, bridges ½″; exhaust 1″x5″. 2. What should be the size of steam chest? *A.* Make the steam chest just large enough for the travel of the valve with an ⅛″ to ¼″ clearance at each end. 3. Do you think such an engine will work well? *A* There is no reason why it should not work well. We should, however, advise higher piston speed.

(307) E W., Lynn, Mass., writes: A certain line shaft has a 30″ pulley belting to a 15″ pulley on a machine. Could I get more power, not taking into consideration speed, by reversing the pulleys; that is, by putting the 15″ pulley on the line shaft and the 30″ pulley on the machine, and if so why? *A.* It depends upon what you mean by not taking into consideration the speed. If you propose to run the machine at its present speed you will get more power because you will have to run the line shaft four times as fast as at present, which will give you twice as much belt speed as you now have. If you do not increase the speed of the line shaft you will not get as much power, because you will only get one-half your present belt speed. One of the most important factors that enters into the question of how much power can be transmitted by a given belt is the speed at which it runs.

(308) J. W., Detroit, Mich., asks: 1. In designing an engine with a cylinder, say, 3 ft. long, how do you find the length of the crank? *A.* First determine the length of the crank you want to use and then make the cylinder the right length for the crank. 2. Will a long or short connecting rod make any difference in the length of the cylinder? *A.* No. 3. How is it that a valve is not set right when it has the same lead at each end of the stroke? *A.* Generally speaking a valve is considered set right when it has the correct and equal lead at each end. Sometimes in lap-valve engines more lead is given in the back than in the forward motion to equalize the cut-off, that is, so that steam will be cut off at equal distances in each stroke. 4. What is meant by "angularity of the connecting rod?" *A.* The angle that the connecting rod makes with a straight line through the cylinder and center of crank shaft. The expression is sometimes made use of in expressing the fact that the connecting rod has the effect of carrying the piston ahead of the position due to the position of the crank pin on the forward stroke, and keeping it behind on the return stroke. 5. How do you find the pressure on the crank pin and on the slides at any part of the stroke, and is the pressure the same on the pin at all points in the stroke, and if not, why not? *A.* It is a matter of considerable complication to find the pressure on slides and crank pin at different points of the stroke and cannot be explained in the room we can devote to such questions. 6. How far will a siphon lift water, and why should the delivery leg be longer than the receiving leg? *A.* A siphon cannot lift water higher than the water will flow by atmospheric pressure, usually about 33 feet. The delivery leg must be the longest, so that the forces through which it operates shall be the greatest in the direction in which the water is to run.

(309) J. L. B., Port Deposit, Md., writes: Some six or eight months ago we got some leather belting from New York that was put together with some kind of glue or cement without any rivets. Since this belting was put into service it has stood the most severe usage without any signs of giving way at the laps. Can you tell me how the cement is made and applied? *A.* The following is a good cement for leather belts: Take of common glue and American isinglass equal parts; place them in a gluepot, and add water sufficient to just cover the whole. Let it soak 10 hours, then bring the whole to a boiling heat and add pure tannin, until the whole becomes ropy or appears like the white of eggs. This cement is to be applied warm. The belt is to be scraped and the grain well roughed with a file, or upon an emery wheel; apply the cement and rub the joint surfaces hard together, placing a weighted board upon it, and let it dry for a few hours. If the job has been properly performed the joint will be as strong as the solid leather, the material composing the cement being very much of the same nature as the leather itself.

(310) D. H., Marshalltown, Iowa, writes: I have had a dispute with a gentleman in reference to the difference of pressure in a locomotive boiler and cylinder. I maintain that a locomotive working with a boiler pressure of 130 pounds will show an average pressure of 90 pounds. My friend says that the average cylinder pressure will be the same as that in the boiler. Who is right? *A.* The average pressure upon the piston of a locomotive is dependent upon the position of throttle, lap upon valve, point of cut-off and speed of the engine; therefore no definite rule can be given. For example, at a slow speed, as in leaving a station with the lever at full gear, the pressure upon the piston will often rise to within a pound or two of the pressure in the boiler; while at a high speed and cutting off at 6 inches the average pressure often falls as low as 40 pounds and even lower. The only way to get the average pressure in a cylinder is to apply an indicator under the varying conditions.

(311) W. H. W., York, Pa., writes: In the *American Machinist* of October 18, 1881, I saw a description of the Blue Process for Copying Drawings and have tried it, but the white lines do not wash out clean and plain, as in some prints I have seen. You will do me a favor by giving some light on the subject. Have tried long and short exposure, as also washing. *A.*—The trouble may have been first in your solution. If the ingredients were not pure, or properly prepared, the results would necessarily be unsatisfactory. Again, if the sensitized paper was exposed before the tracing was placed upon it, the lines would be obscure. The paper should be handled in a dark room, and the tracing placed upon it, care being taken not to move one upon the other in the slightest degree. An exposure of from two and one-half to three minutes on a clear day is sufficient to do the work, and any carelessness of detail must cause corresponding defects. We think your trouble is with the solution, and would advise you, unless you understand chemicals somewhat, to procure your solution from some reliable dealer in that material, as it can be purchased already made at about the same price paid for the ingredients unmixed.

BUSINESS SPECIALS.

Transient Advertisements, 50 cts. a line for each insertion under this head. About seven words make a line. Copy should be sent to reach us not later than Thursday morning for the ensuing week's issue.

F. Samuelson, Pattern Maker, 38 Gold St., N. Y.

James W. See, Consulting Engineer, Hamilton, O.

Steel Name Stamps, &c. J. B. Roney, Lynn, Mass.

Portable Forges, $10. Holt M'f'g Co., Cleveland, O.

Presses & Dies. Ferracute Mach. Co., Bridgeton, N.J.

Hoerle Bros., Naugatuck, Conn. Small Dies and Special Tools to order.

J. C. Hoadley, Engineer and Expert, 29 High St., cor. Federal, Boston, Mass.

Howard S. Abbot, Solicitor of Patents, 617 7th St., opposite the Patent Office, Washington, D.C.

R. Dudgeon, 24 Columbia st., New York, Improved Hydraulic Jacks and Roller Tube Expanders.

Latest and best books on Steam Engineering. Send stamp for Catalogue. F. Keppy, Bridgeport, Ct.

Foot Power Machinery, for workshop use, sent on trial if desired. W. F. & John Barnes, Rockford, Ill.

Mechanical Engineering.—To learn inventing, designing and construction of machinery at school. Address, S. W. Robinson, Ohio State University, Columbus, O.

"Steam Economy," 124 pp., cloth, $1.00 (illustrated), points out remedies for defects in engines. Best indicator practice. A. Wilkinson, 123 n. 4th St. Phila. Sent by mail, free.

"How to Keep Boilers Clean," and other useful information for steam users and engineers. Book sent free by the publisher, Jas. F. Hotchkiss, 84 John street, New York. Mention this paper.

We will pay 25 cents each for copies of the AMERICAN MACHINIST for January 1, 1881, which are clean and in condition for binding. American Machinist Publishing Co., 96 Fulton street, New York.

Russell & Struthers, Wax Process for making outline engravings. Specimens each week in the AMERICAN MACHINIST. We also do Map Engraving with best facilities. Russell & Struthers, 59 Park Place, New York.

Practical Instruction in Steam Engineering, Steam Fitting, Mechanical Drawing, Blast Furnace Construction and Metallurgy. Situations furnished to graduates. Apply for pamphlets, National Institute, Waverly Place and Green street, New York.

If you desire to keep pace with the daily progress and development of Telephone, Telegraph and Electrical matters, have a copy of the NEW YORK REVIEW OF THE TELEGRAPH AND TELEPHONE sent to your address. Only $2.00 per annum. George Worthington, Editor and Proprietor, No. 23 Park Row, New York. P. O. Box 3329.

Bound Volumes and Patent Binders. We can furnish Volume 3 of the AMERICAN MACHINIST, containing the full 52 issues of 1880, or Volume 4, containing the 53 issues of 1881, neatly bound in cloth, ready to ship by express, for four dollars. Either volume unbound, three dollars. "Patent Binder" for the AMERICAN MACHINIST holds 53 weekly issues in good shape. Sent to any address by mail for one dollar. AMERICAN MACHINIST PUBLISHING CO., 96 Fulton Street, New York.

"Extracts from Chordal's Letters," the most interesting mechanical book published. A great variety of mechanical and business topics treated in a wise and witty way that will be instructive to old and young mechanics, and interesting to everybody. As many as 150 copies have been sold in a single shop. Over 40 humorous illustrations; 320 pages, 12mo. Price, $1.50 per copy, by mail, to any address. AMERICAN MACHINIST PUBLISHING CO., 96 Fulton St., New York.

Rocks, Minerals and Stocks; by Frederick H. Smith, Consulting Engineer and Geologist. Contents: Part I. World Building, Prime Minerals and Rocks, the Formation; Part II. Gold and Silver, Industrial Metals, Coal and Oil, Industrial Minerals, Precious Stones; Part III. Stock Companies, Stock Dealing, Stock Tricks. *A vade mecum* for the use of everyone interested in these important topics. Scientifically accurate, witty, fascinating. *Sui generis* among technical books. Handsomely bound in cloth, $1.50, in paper, 75 cents. Order through your bookseller, or address The Railway Review, 182-184 Dearborn St., Chicago, Ill.

MANUFACTURES.

Local papers report the probable starting of a number of new silk manufacturing industries at Paterson, N. J.

The Louisville, New Albany & Chicago Company have decided to locate their extensive shops at Lafayette, Ind.

The Rodney Hunt Machine Manufacturing Company, Orange, Mass., have commenced work in their new foundry.

The Fairbanks Scale Works, St. Johnsbury, Vt., are working overtime on a Government order for 6,000 letter balances.

The works of the Nickel Bronze Smelting Company, of McKeesport, Pa., are to be rebuilt on a larger scale.

Durkee & Doe, Chicago, are bringing out an improved iron shaper, and a new pulley, drilling, and tapping machine.

The project for the establishment of a rolling mill for Des Moines, Iowa, with a capital of $250,000, is fast taking shape.

The Colorado Coal and Iron Company, Pueblo, Col., have recently completed arrangements for the manufacture of stoves.

The Eagle Foundry, Sutcliff & Bird, is a new establishment in South Chicago. Foundry is 35x40 feet and has one 15 ton cupola.

A. B. Laws, Bridgeport, Conn., has started to manufacture brass and iron globe valves. He also intends to build engine lathes.

Colby Bros. & Co., of Aurora, Ill., have in course of construction 24 engines. This firm is also building a number of drill presses.

The new foundry and additions to the machine shops of the Murray Iron Works, of Burlington, Iowa, are expected to be finished about Oct. 5.

The Para Rubber Company, of Framingham, Mass., has adopted the Curtis Pressure Regulator for their heating apparatus, drying room and steam pumps.

The Watt Mining Car Wheel Company, of Barnesville, Ohio, have taken advantage of the dull season and put an addition of 20x110 feet to their works.

The addition to the Crompton Loom Works, Worcester, Mass., is nearly ready for the machinery. The building is 70x50 feet and four stories high.

Grant & Bogert, Machine Tool Works, Flushing, N. Y., now have 94 men at work in foundry and machine shop. They are crowded with orders for lathes and shapers.

The Allen Paper Car Wheel Company are making large additions to their works at Morris, Ill. Amongst other new buildings will be a boiler house to contain six new boilers.

The Newmarket Manufacturing Company, Newmarket, N. H., are setting a battery of four boilers with the Jarvis furnace. This is the second lot of boilers this company have set with this system.

Col. Amzi S. Fuller, of Uniontown, Pa., is erecting a foundry at Roncevert, W. Va., a town on the Chesapeake and Ohio Railroad, and having a population of about 600.

The Betts Machine Company, Wilmington, Del., have just furnished Mackintosh, Hemphill & Co., of Pittsburgh, with a planer to plane twenty feet long and eight feet wide and high.

A charter has been issued to the Bradford Bridge Company, of Pittsburgh, which proposes the erection of a bridge across the Youghiogheny at Bradford. Capital stock, $100,000.

The Calumet Tool Company, of South Chicago, experience great difficulty in obtaining experienced tool makers, says the *Industrial World*. They are turning out 1200 lbs. of manufactured goods daily.

There are now over 1,500 employes at the Lowell Machine Shop, Lowell, Mass., more than in any previous year. When the improvements now in progress are completed there will be 400 additional hands employed

J. L. Reynolds, Monson, Mass., is having a 5x16 foot boiler built by the Whittier Machine Co., of Boston, which will be set with the Jarvis furnace to burn pea coal. New boilers are also being put in the Academy of Music at Chicago and set with the same furnace.

The Milwaukee, Lake Shore and Western Railroad's machine shops at Kaukauna, Wis., are being erected as fast as possible. The roundhouse is nearly completed. Over twenty engine stalls are ready for the engines. It is intended that the shops be finished by the 1st of October.

The Evan's Artificial Leather Company, Salem, N. H., have decided to increase their works owing to the demand for their goods. They have ordered two steel boilers which will be set with the Jarvis furnace, also will put in the Sheffield grate bars They will burn screenings without a blast.

The South Pueblo, (Col.) M'f'g Co., has recently been organized by E. S. & W. A. McKinlay and C. J. Harris. They are building large machine shops and an iron foundry. In about six weeks their works will be completed to manufacture all kinds of machinery for the mines, also general castings.

The citizens of Norwalk, Conn., have abandoned the project of securing the Wilson Sewing Company's Works, at present at Chicago, to that place, on account of the large capital required. The new company would be expected to buy out the tools, machinery and fixtures of the Chicago concern for $150,000, and buy their building for $50,000 more.

The American Lumber Company, Toronto, has bought the pine on 500,000 acres of the Detroit, Mackinac & Marquette Railroad Co's land in the northern part of the state, and about 225,000,000 feet on other tracts. A mill with a capacity of 100,000 feet a day is being put up, and another is promised. The company will this winter cut about 14,000,000 feet.

A charter has been issued to the Lehigh Rolling Mills Company for the manufacture of iron and steel, with a capital of $1,000,000. The business office will be located in Philadelphia and the operations carried on at Allentown, Pa. The stockholders are Ario Pardee, Hazleton; Ario Pardee, Jr., Montgomery County; Franklin A. Comly, Montgomery County; John R. Fell and Harry C. Cochran, Philadelphia.

Richard Dobbins, of Lowell, Mass., is building a six foot steel boiler for the Winnepisogee Paper Company, Franklin, N. H. This boiler is to be set with the Jarvis furnace to burn waste bark and wood from the pulp works. Previously all this fuel has been piled in heaps and burned by itself. The construction of this furnace will be more like an oven, as the fuel will be fed through a hopper over the fire.

The Dallas (Texas) Car and Agricultural Implement Co., was organized last February with $100,000 cash capital. It has erected shops that now give employment to one hundred men manufacturing all kinds of modern agricultural implements, also buggies. The officers of the company are Col. J. B. Simpson, President; Maj. J. B. Vaughn, Secretary; Capt. S. M. Brosins, General Manager, and Sam. Peterman, Treasurer.

The Vulcan Works, Chester, Pa., have added to their present works a plant of fifteen tons per week capacity for making semi-steel castings according to the process of J. E. Bolt, of the Nottingham (Eng.) Malleable Iron Works. It is claimed that these castings are perfectly homogeneous and free from blow holes; that they harden and temper perfectly, but weld imperfectly owing to the carbon being higher than welding limit.

The citizens of Lafayette, Ind., are very jubilant over having received official notice that the Louisville, New Albany & Chicago Railroad Company have decided to locate their new and extensive shops in that place. In consideration of the location in that city sixteen acres of land and $25,000 are to be donated to the railroad. The buildings will be at once erected and when the shops are completed a large number of men will be employed.

At Chester, Pa., Roach's Ship Works are fairly busy. The Chester Steel Castings Company have just put in a large cupola over 6 feet diameter and 35 feet high having a special arrangement of tuyers. This cupola and accessories were made at the Vulcan Works. The Chester Rolling Mills blast furnace and open hearth steel works are busy, and the Combination Iron and Steel Works are now making angle iron as well as steel rails. Robert Wetherill & Co. are very busy building Corliss engines.

The Tehuantepec Railroad Company having forfeited its charter the Mexican government has resolved to complete the road as soon as possible. The company will be paid for the work done and the material on hand. The work will be continued under the charge of General Porfirio Diaz, as governor of Oaxaca. Delfino Sanchez, ex-superintendent of the Morolas R., has been appointed purchasing agent. He will soon start for the United States and Europe to buy rails and rolling stock.

Plans have been perfected for the new Malleable Iron Works, at Syracuse, N. Y., to be erected by Mr. Willis E. Jones. The buildings will be two in number, one 62x250 feet, of one story, 16 feet, with truss roof, designed for kilns, tumbling, engine and boiler, and shipping office. The other, 110 by 220 feet, one story, 16 feet, with truss roof, to be used as a foundry. The material will be brick and the structure will be of a substantial character. A third building, designed as a pattern room, will follow the erection of the two mentioned above. The work of erection has been commenced and will be pushed forward as rapidly as possible.

Bath, Me., has had an enthusiastic meeting to decide whether it shall have a first-class machine shop for building marine engines for 2,000-ton ships The sum of $100,000 is needed to insure the success of the enterprise. About $50,000 has already been subscribed. The yard where it is proposed to build the ships and the engines has been refused at $25,000, which price is regarded low. It is proposed to build compound engines, and to have a shop that will carry along four or five engines a month, keeping pace with the hulls. The tendency has always been to build the engines where the hulls were built. In the present shops at Bath a compound engine could be built in eight months. Another meeting on the subject will be held on (this) Saturday evening.—*Boston Commercial Bulletin.*

Machinists' and Engineers' Supplies.

NEW YORK, Aug. 24, 1882.

The volume of trade in supplies is increasing somewhat and almost all kinds of goods in that line are coming along quite freely. Wrought Iron Pipe continues stiff at 57½ per cent. discount from list, and some sizes are very difficult to obtain.

Machine tools are more easily procured except the larger sizes the supply of which is still behind the orders. Bolts and Nuts are fluctuating.

Iron and Metal Review.

The demand for Pig Iron continues about the same as last reported. Consumers are averse to stocking up and therefore orders continue small. We quote prices unchanged as follows: Foundry, No. 1, $26 to $26.50; Foundry, No. 2 X, $24 to $24.50; Grey Forge, $20.50 to $21.50. Foreign Iron is a little easier with prices as follows: Coltness, $26.50 to $27; Glengarnock, $24.50 to $25; Gartsherrie, $26 to $26.50; Summerlee, $26 to $26.50; Carnbroe, $24; Eglinton, $23.50 to $24; Langloan, $26.50 to $27. Wrought Iron Scrap firm at $29 to $30. Copper is unchanged at 18¼c.; Banca Tin, 28c; Straits and Malaca 25⅝c. to 25¾c.; Billiton, 25c. to 25¼c.; Australian, 25¼c. to 25½c. Lead, common, 5.05c. to 5.10c.; Refined, 5¼c. to 5.15c.; Spelter, 5.40c. to 5.60c. for Common Domestic, and 8c. to 8¾c. for Refined; Antimony, 11c. for Hallett's and 13c. for Cookson's.

WANTED

"Situation and Help" Advertisements, 30 cents for each seven words (one line) each insertion. Copy should be sent to reach us not later than Thursday morning for the ensuing week's issue.

Wanted—A Foreman for a Mowing Machine Shop. Address The Victor Mower Co., Niverville, N. Y.

Wanted—Position as foreman of machine shop, railroad preferred, 8 years' experience as foreman, best of reference. Address Foreman, this office.

Wanted—Machinists who are competent to superintend the erection of engines and general machinery. Corliss Engine Works, Robert Wetherill & Co., Chester, Pa.

Japanner.—Steady employment for a first class striper and ornamenter on machinery. Must be steady and have good references. Address Paint, AMERICAN MACHINIST office.

Wanted—Situation as assistant draughtsman in machine shop on working drawings. Have had four years experience. References. Address Box 9 this office.

Wanted.—A superintendent for a first-class establishment working 250 men. Must be well up in all departments and have a thorough knowledge of automatic cut-off steam engines. Address, Competent, this office.

To Capitalists—A leading Draughtsman and Superintendent wishes to meet with suitable opening. Could introduce new lines of business if required; accustomed to engines, steam cranes, tools, etc. Address, Philada, care AMERICAN MACHINIST.

A mechanical engineer, at present manager in a machine tool manufacturing business, will soon be at liberty and desires a position. Is well up in stationary engine, tool and general designing and construction. Address A. J., Box G, Auburn, Me.

Wanted—Young man to take charge of machine shop (light work) in a manufacturing concern very near New York. Must be one who has been educated in a modern shop, and who is quick, sharp, intelligent, systematic, and a driver. Address "C. H. & L." BOX 13, AMERICAN MACHINIST office.

An experienced mechanical engineer now superintending and designing machinery for one of the largest companies in the United States, wants a position to travel for one or two first-class houses among railroads and manufacturers. Has an extensive acquaintance, having been for some years agent for a leading manufacturer of railway and machinists' tools. Character and references beyond question. Address, Traveller, AMERICAN MACHINIST Office.

For Sale! One 80 H P. Root's Sectional Safety Boiler. J. A. Fay & Co., Cincinnati, Ohio.

For Sale—A Richards Indicator with three springs, new and complete. Address Indicator, Box 2, office AMERICAN MACHINIST.

Engines for sale low. One of 90 H.P.; two 80 H. P.; one 40 H.P.; one 30 H.P.; one 20 H.P., and smaller, nearly new. Can be shipped at once. Also boilers. Fitchburg Steam Engine Co., Fitchburg, Mass.

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Affording the best opportunity for advertising, or of introducing to the public new inventions. Artists, Inventors, Producers, Mechanics and Manufacturers, from every nation, invited to contribute. The product of New England's hand and brain will be well represented. No charge for space. Blank forms for application to exhibit furnished free, upon application to
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COOKE & CO.
(Formerly Wm. Cooke, successor to Cooke & Beggs)
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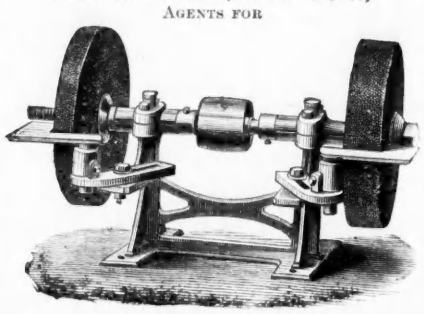
AGENTS FOR



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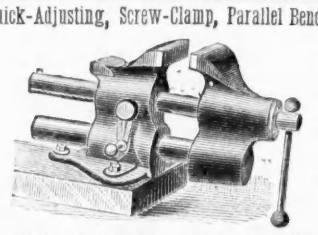
New Quick-Adjusting, Screw-Clamp, Parallel Bench Vise.
Parts interchangeable. Steel Shafts, Screw and handle.



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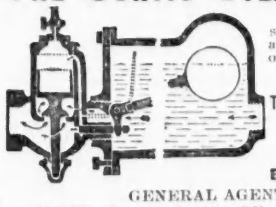
Manufacturers of STOCKS and DIES.

For MACHINISTS, BLACKSMITHS & GAS FITTERS.

THE CURTIS STEAM TRAP.



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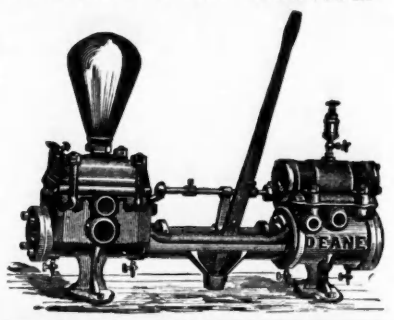

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Of superior quality for machinery and other purposes. Delivered promptly in New York. Estimates given. Castings finished when required.
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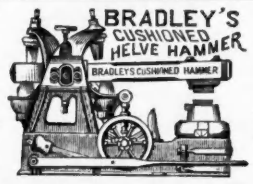

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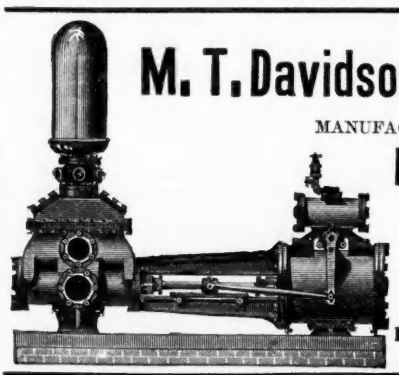

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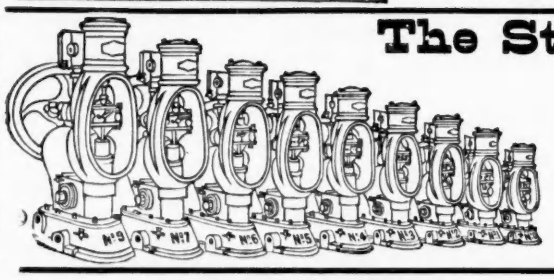

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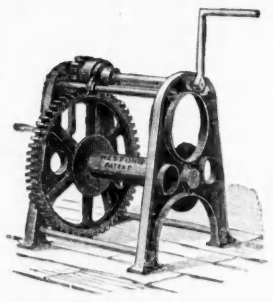
CRABS AND WINCHES.



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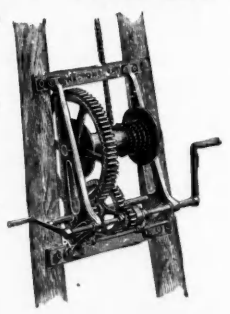

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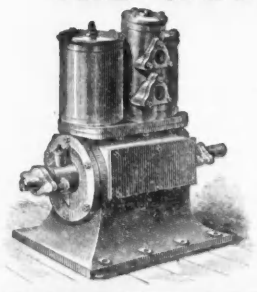

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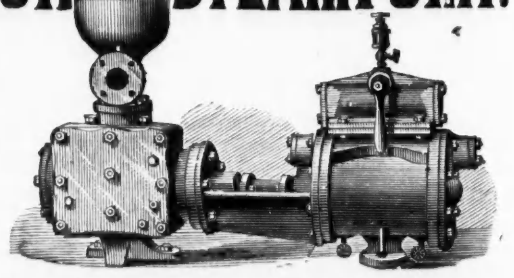

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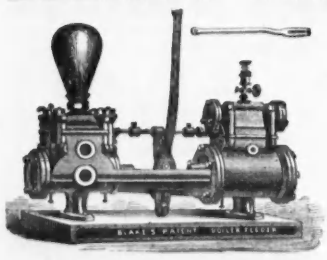

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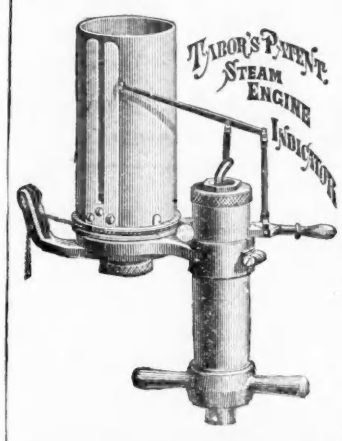

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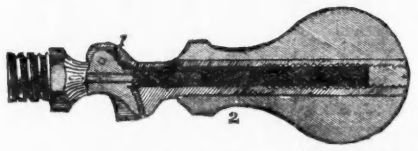

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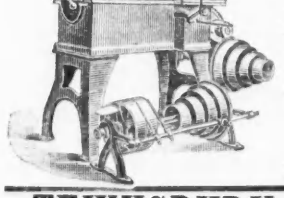

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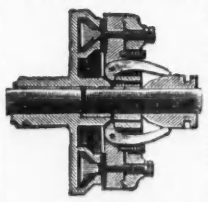

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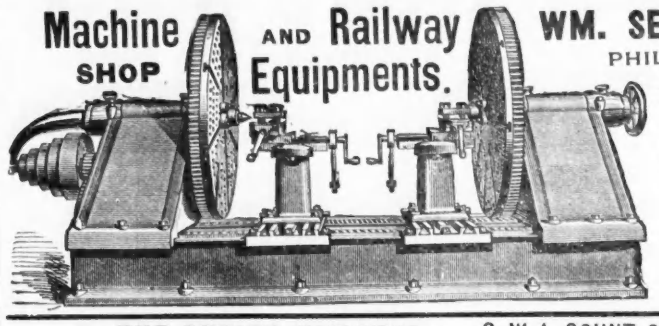

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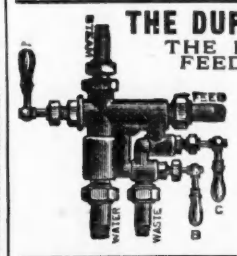

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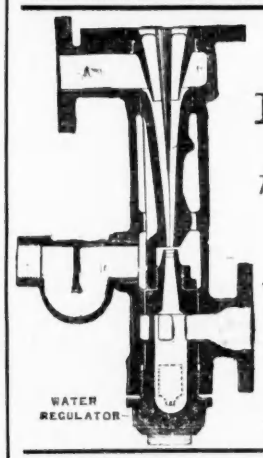

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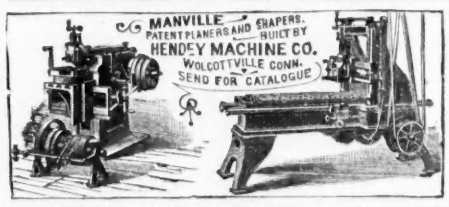

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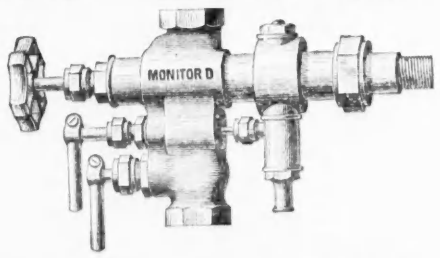

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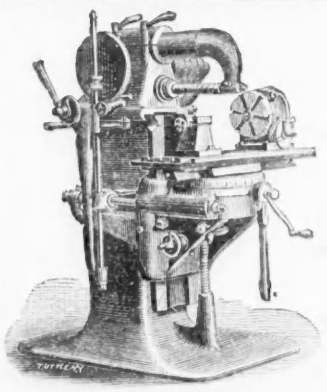

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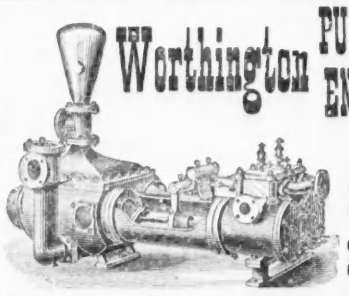

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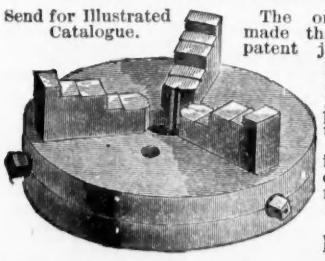

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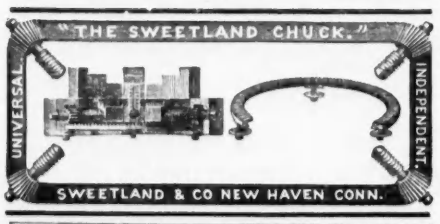

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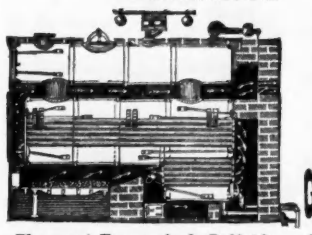

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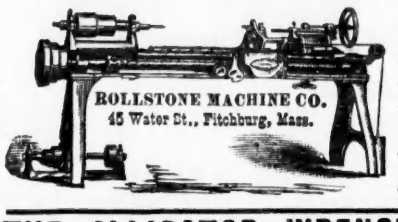

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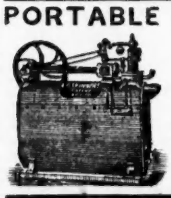

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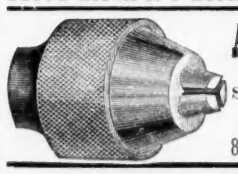

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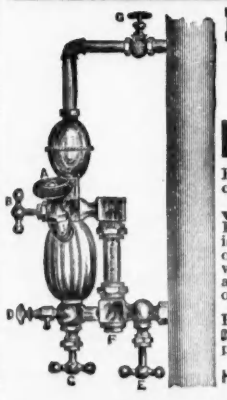

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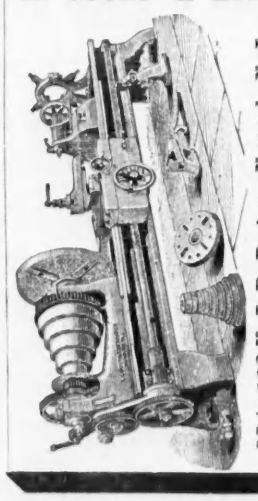

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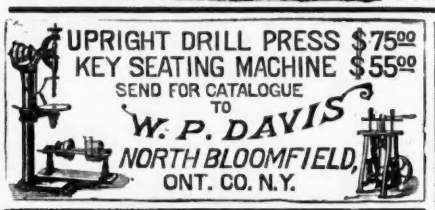

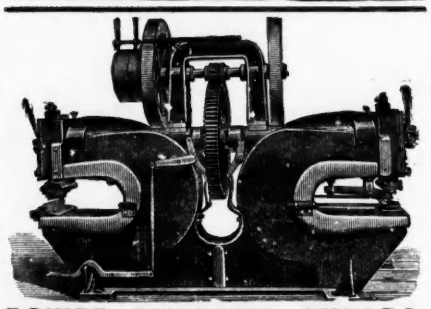

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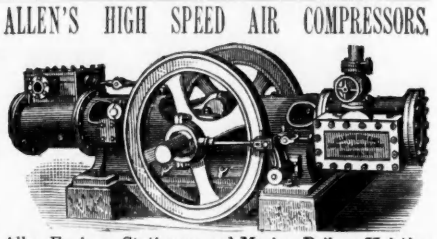

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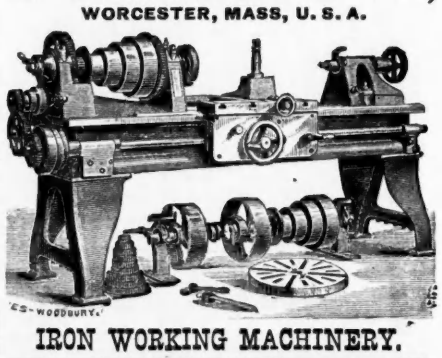

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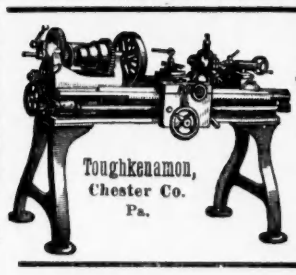

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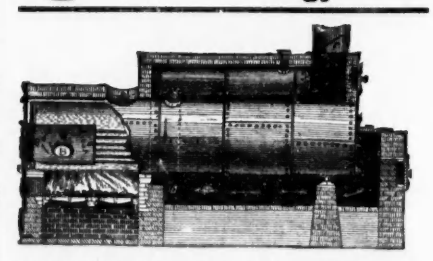

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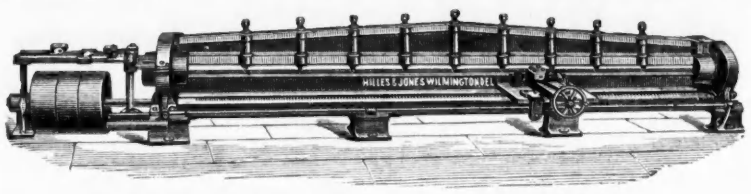

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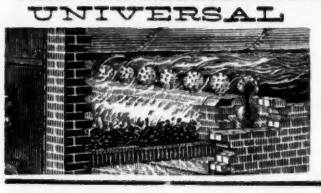

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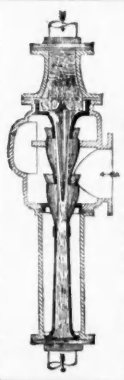

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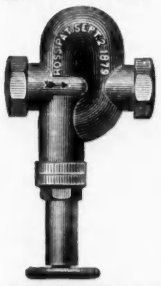

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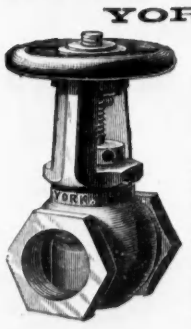

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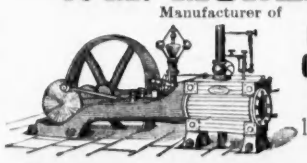

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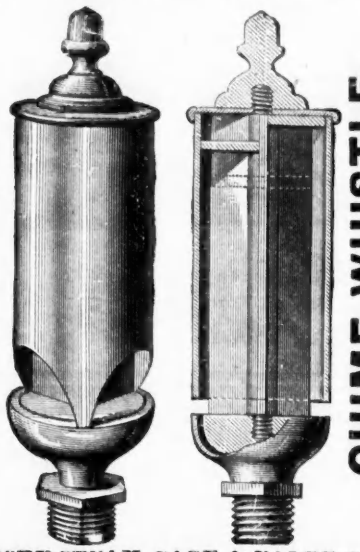

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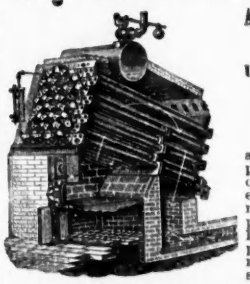

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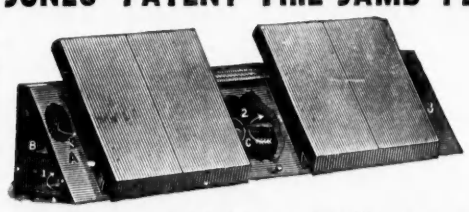

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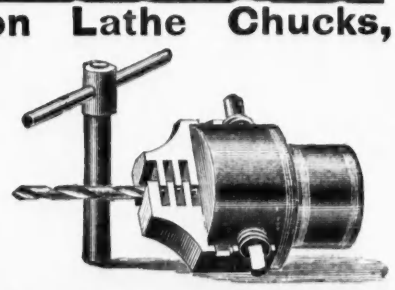

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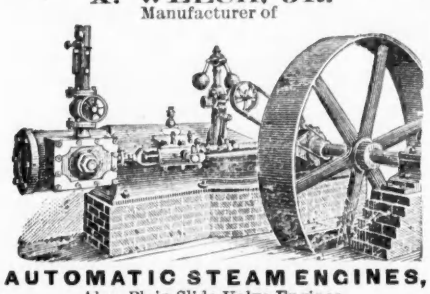

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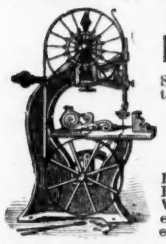

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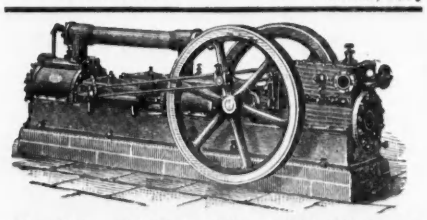

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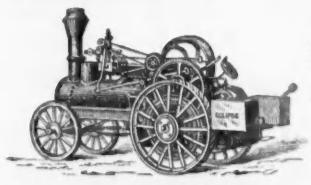

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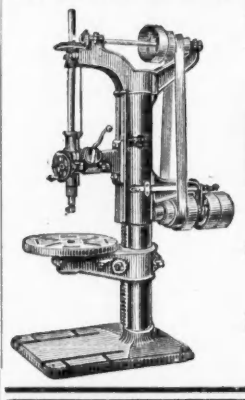

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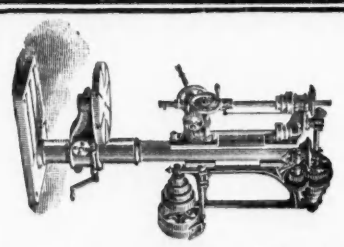

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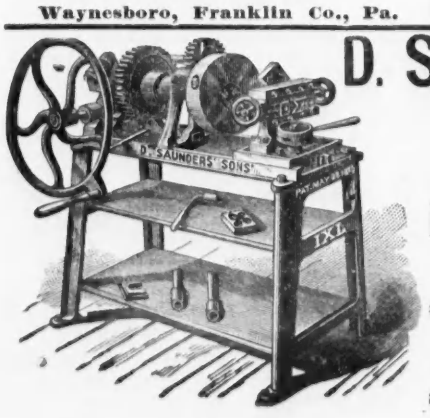

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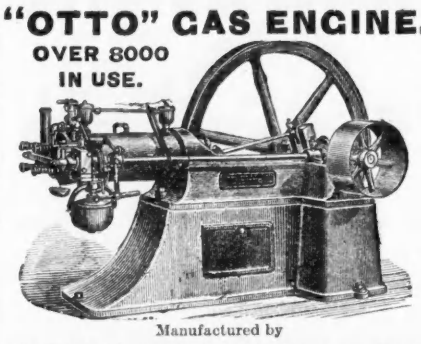

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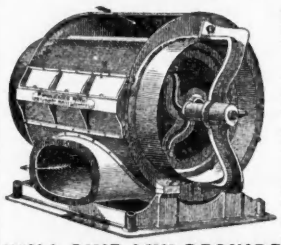

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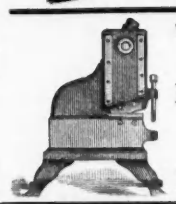

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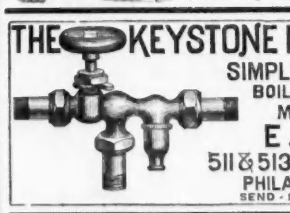

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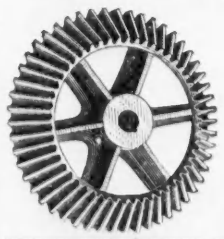

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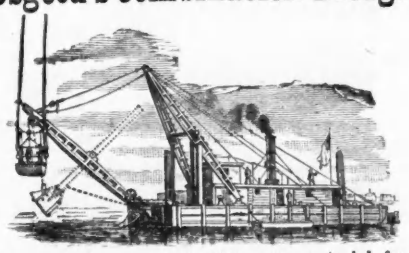

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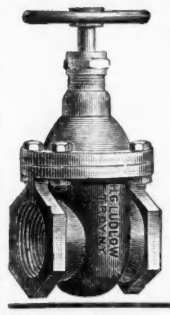

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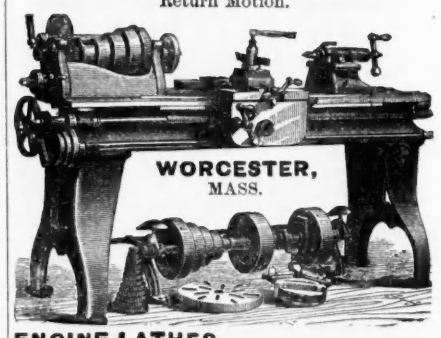

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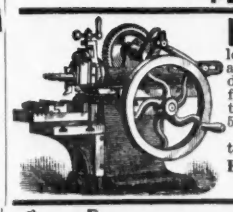

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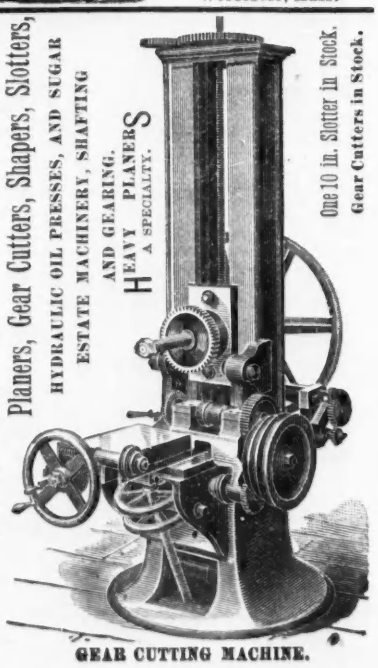

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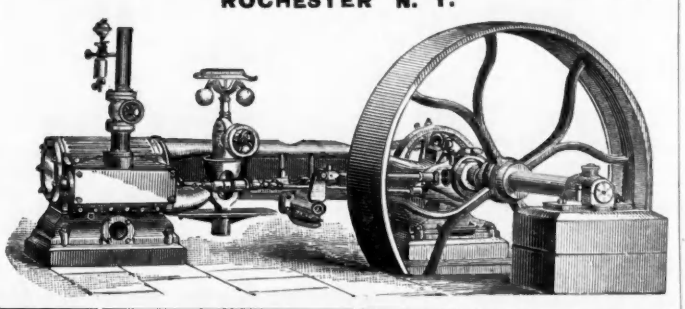

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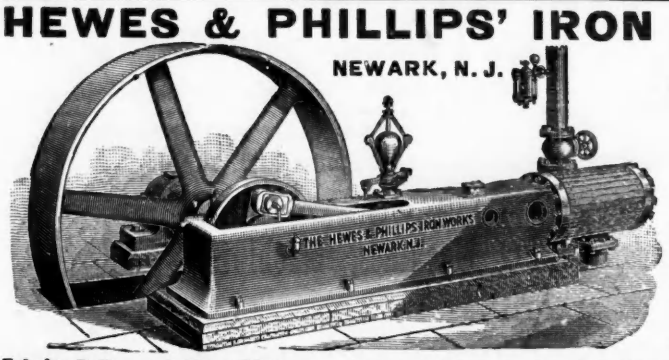

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26 " "	18 "	Fitchburg.
24 " "	14 and 16 "	Fitchburg.
21 " "	12 and 14 "	Blaisdell.
20 " "	14 "	Fitchburg.
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19 " "	10 and 12 "	Gray.
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17 " "	6 "	Johnson.
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36 inch x 36 inch x 9 ft., planer.	2d hand, good order. Wheeler.
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19 inch, " "	Blaisdell.
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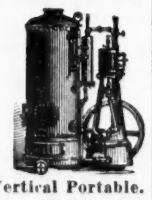

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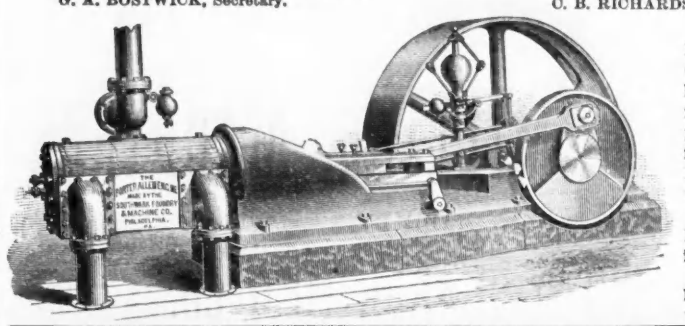

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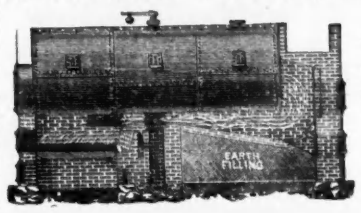

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6	" " 12 in. " x 4 ft. "	New.
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1	" " 21 in. x 6 ft.	In good order. Pond.
1	" " 18 in. x 8 ft.	" " "
1	" " 14 in. x 6 ft.	Star Tool Co. New.
1	" " 15 in. x 6 ft.	"
1	" " 14 in. x 5 x 6 ft.	"
1	" " 16 in. x 6, 7 & 8 ft.	Bridgeport. "
1	" " 13 in. x 5 ft. & 6 ft.	Ames. "
1	" " 16 in. x6, 7 & 8 ft.	Ames. "
1	" " 18 in. x8 & 10 ft.	Lodge & Barker "
1	" " 24 in. x 12 ft.	Perkins. "
1	" " 24 in. x 16 ft.	" "
1	" " 30 in. x 16 ft.	" "
1	" " 22 in. x 10 ft.	Fifield. New.
1	" " 28 in. bed to suit.	New. Fifield.
1	" " 11 in. x 4 ft. & 5 ft.	Prentiss.
1	" " 11 in. x 4 ft.	New.
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1	Plain Engine Lathe, 16 in. x 4 ft.	"
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1	Fox Lathe, 15 in. x 5 ft.	Pike & Dean. "
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1	Planer, 28 in. x 28 in. x 6 ft.	A1 order.
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1	" 16 in. x 16 in. x 3 ft.	new
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2	" 20 in. x 20 in. x 5 ft.	"
1	" 26 in. x 26 in. x 7 ft.	
1	Upright Drill, 16 in.	Prentiss. "
1	20 in. Upright Drill.	" "
1	23 in. "	" B. G. S. F. Thompson. New.
1	24 in. "	" Prentiss. New.
1	30 in. "	" " "
1	15 in. Shaper.	Gould & Eberhart. "
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1	26 in. swing, 14 ft. bed.	Aug. 25th.
1	32 in. x 8 ft.	Planers. New. Sept. 1st.
1	38 in. x 10 ft.	" " Aug.
1	38 in. x 12 ft.	" " "

The following on hand:

1	26 in. swing, 12 ft.	Bed Engine Lathe.
1	22 in. " 13½ ft.	" " New.
1	22 in. swing, 11½ ft.	Bed Engine Lathes. New.
2	22 in. " 12 ft.	" "
4	19 in. " 8 ft.	" " "
2	18 in. " 8 ft.	" " "
5	15 in. " 6 ft.	" " "
1	Square Arbor Fox Lathe.	New.
1	15 in. swing, 9 ft.	Hand Lathe. New.
3	12 in. " 6 ft.	" " "
1	10 in. " 4½ ft.	Bed Hand Lathe. New.
2	30 in. x 8 ft.	Planers. New.
1	26 in. x 7 ft.	Planer. New.
2	26 in. x 5 ft.	" "
1	22 in. x 4 ft.	Planer. New.
2	38 in.	Swing Upright Drills. B. G. & S. F. New.
1	26 in.	Drill. B.G.&S.F. New.
1	18 in.	Bench Drill.
1	4 "	" New.
1	3 "	" Second-Hand.
2	4 "	" "
2	Wall Drills, heavy.	Second-hand. 60 in
2	12 in.	Shapers. New.
2	15 in.	" "
1	Sellers Milling Machine.	2d-hand.
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1	Pond's Double Milling Machine.	2d-hand.
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2	4½ in Hyde's Patent Centering Machines.	New.
1	Emery Grinder, 2d-hand.	for 10 in. Wheels.
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1	Double Nut Tapper.	New Horizontal.
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3	Double-Acting Presses, No. 3,	nearly new.
4	Single-Acting Presses, for power,	"
100	Foot Presses,	nearly new.
2	Small Power Punching Presses.	Second-hand.
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1	Lot Pistol Machinery.	Second-hand.
4	Grind Stones and Frames.	New.
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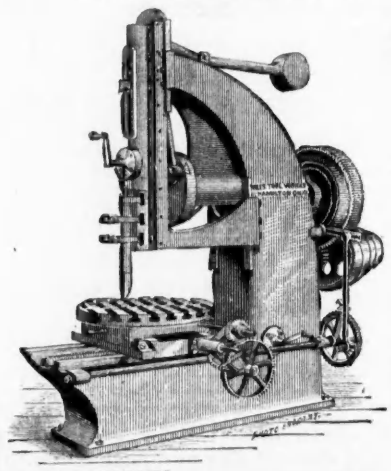

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Feeds always take place at upper end of stroke—never during cut.

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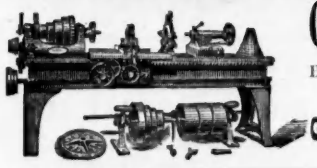

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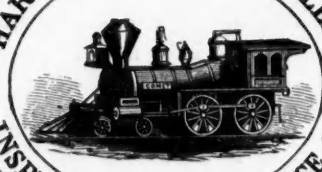

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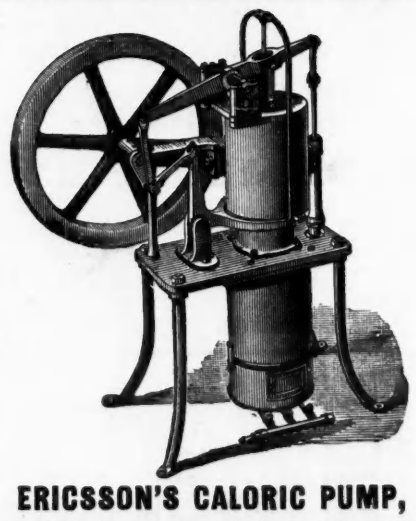

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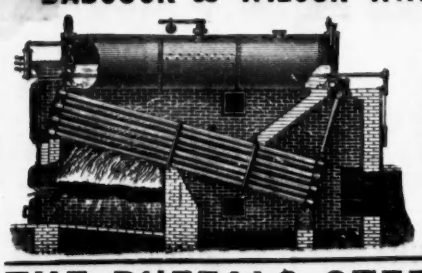

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